CANADIAN GEOGRAPHICAL JOURNAL

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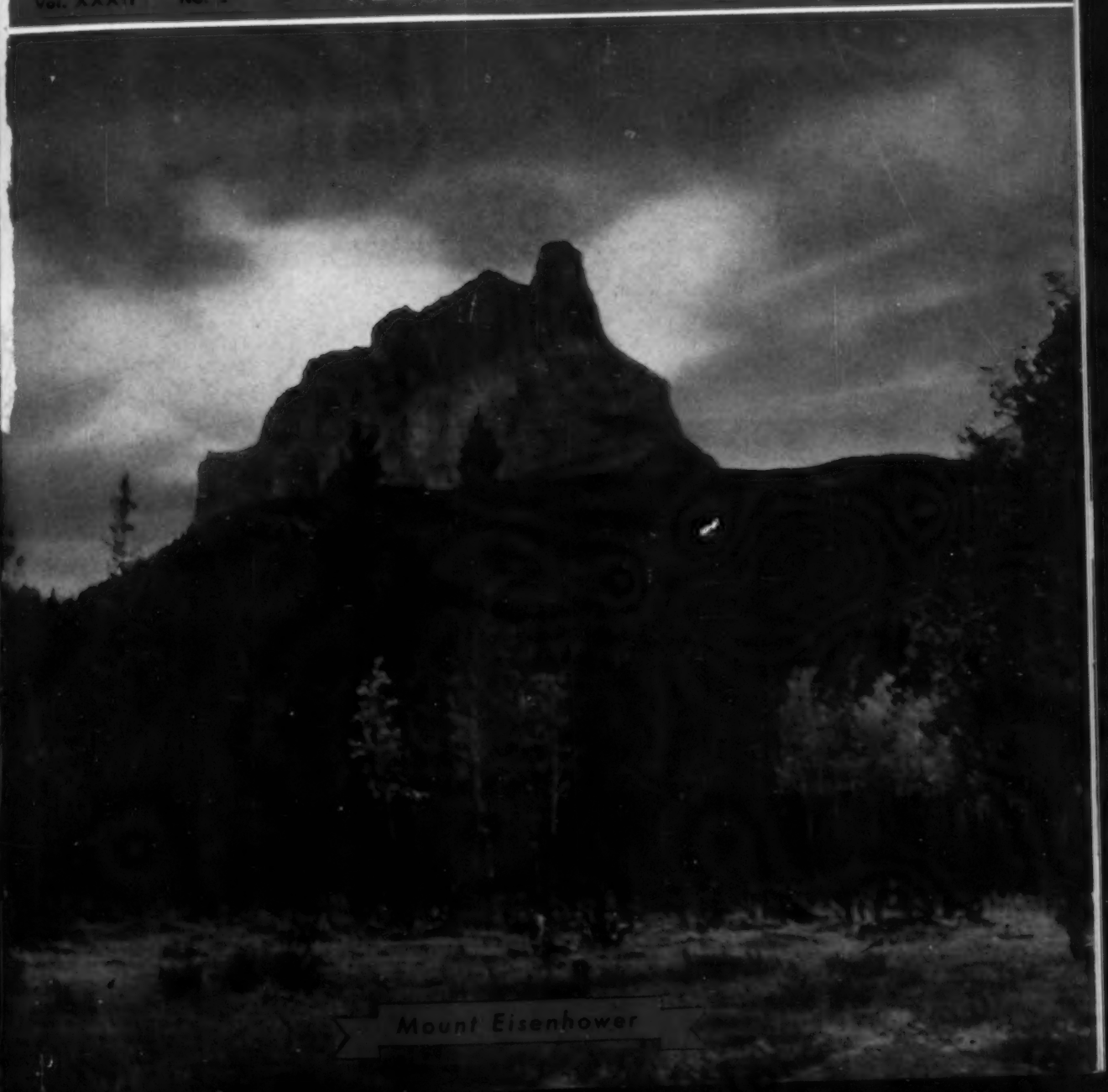

Mount Eisenhower

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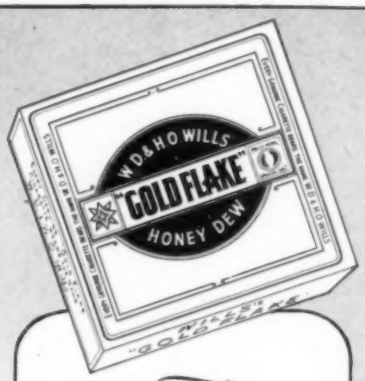

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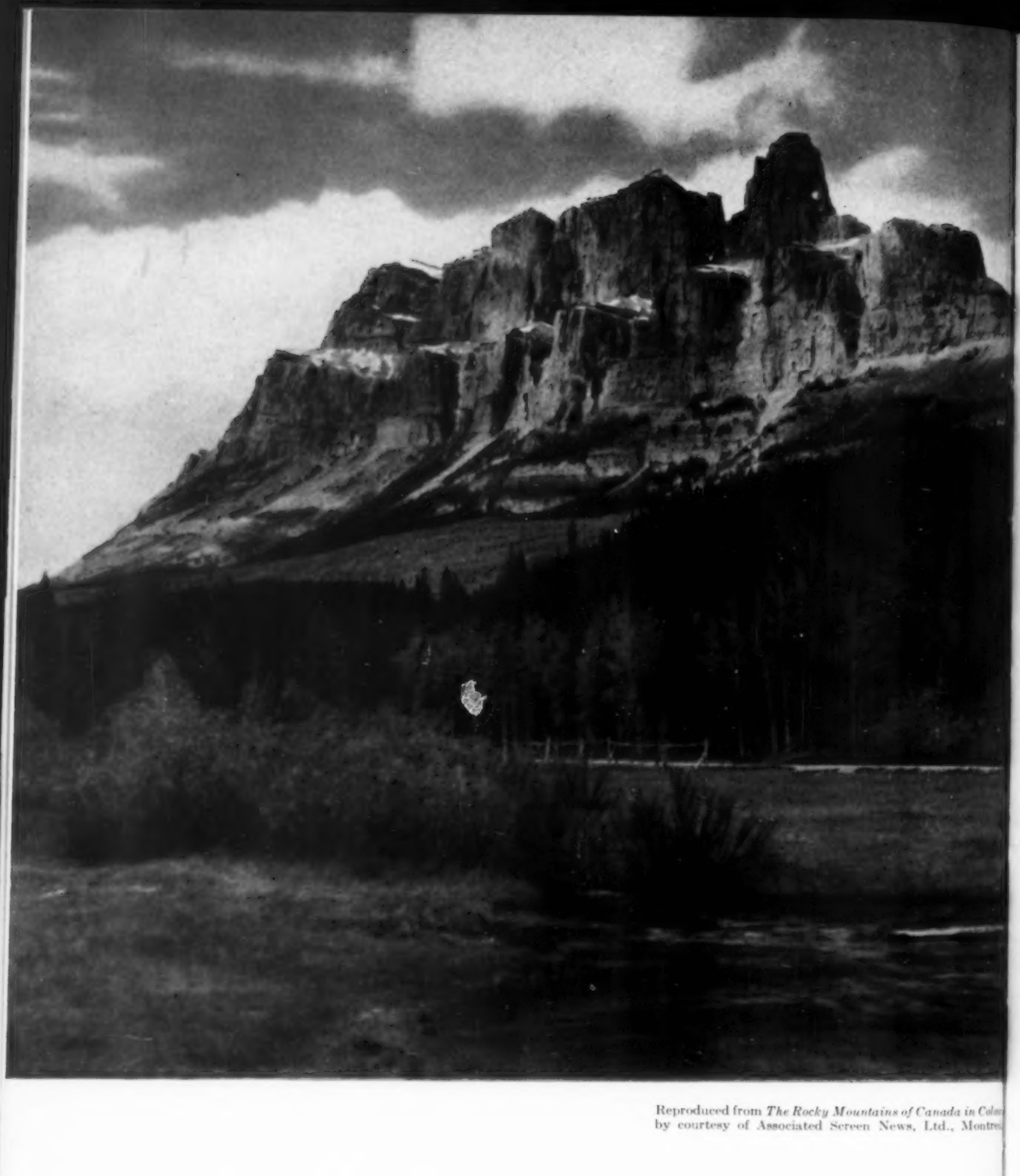

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"Rising majestically thousands of feet into the clear wind-swept air of the Canadian Rockies, Mount Eisenhower is unquestionably the predominating feature of the landscape in the area lying between the world-famous resorts of Banff and Lake Louise. The impression received by the beholder at the first sight of this mighty mountain, rearing its stupendous bulk for eleven miles along the northern boundary of the valley of Bow River, is that it is not a work of nature but a gigantic castellated rampart erected by Titans in past eons to secure for themselves forever undisputed dominion over the broad valleys spreading out in all directions from its impregnable foundations."

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PRINTED IN CANADA

Dwight D. Eisenhower

General Eisenhower Visits Canada

An address by General of the Army, Dwight D. Eisenhower, Chief of Staff of the United States Army, to the Canadian Club, Ottawa, January 10th, 1946

EVER since the war ended in Europe I have been hoping for an opportunity to visit Canada. My purpose was deeper than mere desire to renew association with old Canadian friends. I have wanted to come here so that I might, in the heart of their homeland, pay humble tribute to the soldierly virtues of those wartime comrades and, from a more personal viewpoint, give expression to my gratitude for their loyal and faithful adherence, through long years of war, to the principle and substance of Allied unity.

It is beyond the power of any man to add to the lustre of the military reputation established by the brave men and women of Canada who served with me in Europe. They have written their own proud record in your hearts and in those of all men whereever freedom is venerated. But it is only simple justice to state that in an Allied force numbering in the millions, and in which courage and fortitude were so much the rule as to be taken for granted, assignment of vital battle objectives to the Canadians brought to the High Command only feelings of satisfaction and of confidence. The First Canadian Army under General Crerar will always be remembered and respected as an invaluable member of the Allied team.

No man could command a force in which your Canadians were included without feelings of deep humility and lasting pride. Because I had that privilege, those men were, for many months, *my* Canadians, too, and no one can take from me the place they hold in my affection and admiration.

Memory goes back to my first contacts with them in Britain, when they were commanded by General McNaughton. That summer they carried out the memorable Dieppe operation, in which one of those freak chances of war resulted in a casualty list of saddening proportions. Yet let no one tell you the Dieppe affair was devoid of valuable results. I know of no other single incident that did so much to confirm convictions that the coastal fortifications in France could be successfully breached on a large scale. Moreover, out of that operation many battle leaders derived valuable lessons that were applied later to the amphibious operations in the Mediterranean, and, still later, when we lunged across the channel for the final invasion.

Canadians first came under my command in Sicily. From that moment onward we served together in Italy, France, Belgium, Holland and, finally, in Germany. Other stirring pictures come back to me—the Royal Canadian Navy pressing home the assault against the Normandy beaches, the bold pilots of the Royal Canadian Air Force riding herd in the skies and covering the battle-path of their comrades on the ground all the way from the beach to the Elbe. Great fighters, in great events! They lived history—a bright page of history.

I think I can best express my feelings toward my Canadian comrades by saying that I am truly grateful to the fathers and mothers who sent those men and women to serve in the Allied Command in Europe, and equally grateful to all who, here in their homeland, supported them unstintedly throughout the years of conflict.

Canada may point, with justifiable pride, to a dozen directions in which she made vitally important contributions to Allied victory. In carrying on the great air-training programme, in providing mountains of munitions, in convoying ships through seas infested with submarines, in sending needed cargoes of foodstuffs—in all these and many more your record needs no embellishment from me.

Throughout this war our two nations have been drawn together in planning and producing for a common cause. It has been a co-operation which seemed as natural as it was inevitable. Our nations are such good

Left:—General of the Army, Dwight D. Eisenhower, Chief of Staff of the United States Army and former Commander of the Allied Armies in Europe.

friends that we take neighbourly collaboration as a matter of course. During the two years when you were at war and we were not, some twelve thousand American citizens crossed your border to enter the armed forces of your country. After the Jap attacked us and the European Axis declared war, *26,000 individuals of Canadian birth* entered our own armed forces. These reciprocal acts seem to me spontaneous evidence of the friendship that must forever exist between our two people.

There is other concrete evidence of effective war co-operation between our two countries. Under the far-sighted leadership of Prime Minister, Mr. Mackenzie King, and of our late President Roosevelt, common problems were solved by the devotion to them of common resources.

Among these were the defence of Newfoundland and the Maritime Provinces, the development of an air route across Canada to Alaska—since known as the Northwest Staging Route—, an air route over Hudson Bay, and the overland Alaskan Highway. A con mon readiness to venture boldly resulted in the initially hazardous airway across Labrador, Iceland and Greenland which, in a few short years, has made air travel to Europe a commonplace. Co-operation exploited for war purposes the great ports of embarkation at Halifax and Prince Rupert in British Columbia.

We, in the United States, keenly realize that success in these and other vital projects demanded generosity and many concessions on the part of the Canadian Government. As a soldier-citizen of your neighbouring country, it is a great privilege to express to you deep and lasting gratitude. The Allied victory in Europe stands as a monument to teamwork and to the results of practical understanding between nations. Nowhere was that teamwork more effective than here in our two homelands. Even customs duties were relaxed and the freest exchange of personnel, materiel and all types of commodities was permitted across the International Border. Through these means the efficient prosecution of the war was immeasurably increased. As a direct consequence hostilities were shortened!

In addition to Canada's contribution to victory in Europe, our joint operational effort extended to other sections of the globe. A Canadian combat team participated in the Aleutians campaign. Over a long period of time squadrons of the Royal Canadian Air Force and units of the Royal Canadian Navy operated jointly with United States forces in the North Pacific. Hundreds of American soldiers were trained in Canadian schools during the war, and this practice was pursued, also, in the opposite direction.

In this reminiscent review of the war years, I have refrained from mentioning, until now, one specific instance when my attention, as a Commander, was intensively directed toward the Canadian sector. The First Canadian Army covered itself with honour in the Beach-head, in the bitter attack beginning February 8, 1945, and in the operation across the Rhine. But the instance in which it produced, from my viewpoint, its greatest climax was when it undertook the hazardous mission of clearing the Scheldt Estuary, key to the great port of Antwerp. Although we had already taken the city and port, they were useless to us while the Germans commanded the approaches. We had to work that port—final victory came directly to depend upon its early usefulness. When Field Marshal Montgomery turned the task over to my old friend, General Crerar, and the Canadians, I knew the task would be brilliantly and expeditiously executed.

It is a great accomplishment such as that one which I like to remember. The end of Naziism was in clear view when the first ship moved unmolested up the Scheldt. Yet retrospective satisfaction is saddened always by the memory of brave men whose lives have been spent in the victory, of gallant soldiers whose priceless courage has bought, for us, the peace. There is no way to pay to them and their loved ones an equal devotion, except as we strive as unselfishly and gallantly to maintain the peace as they strove to win it.

The tragic, turbulent years of war ended last May in Germany, last August in the Pacific. Now the victors have set themselves a new and even greater task—to work out a formula and a practical procedure intended to smooth international frictions, to find a way to banish war forever from the world.

I hate war as only a soldier who has lived it can, only as one who has seen its brutality, its futility, its *stupidity*. Yet there is one thing to say on the credit side—victory required a mighty manifestation of the most ennobling of the virtues of man—faith, courage, fortitude, sacrifice! If we can only hold that example before our eyes; moreover, if we can remember that the international co-operation then so generously displayed points the sure way to the success of the United Nations Organization, then the war can never be regarded as a total deficit. I have heard people say that wartime unity was based *only* on necessity—that now, when necessity has passed, we may expect differences which were forgotten in the urgency of a common fear! But the falsity of that contention is clear, because *the necessity for co-operation has not passed*. Nations that joined together to defeat ruthless enemies have even greater reason to remain united for the peaceful settlement of their differences lest new Hitlers rise to throw the world into a chaos more awful than the shattered countries of Europe present to-day. That is what we squarely face!

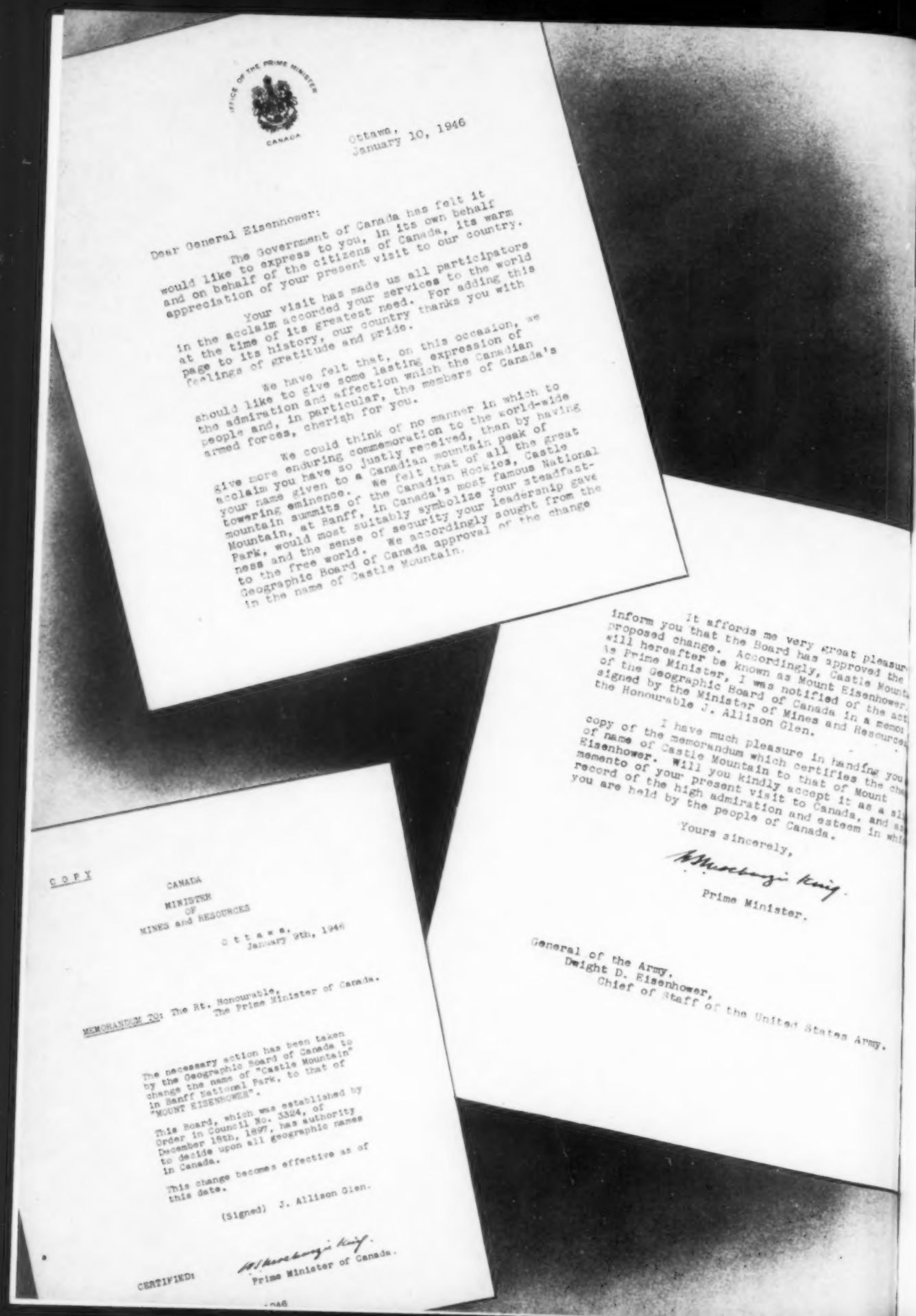
Our two nations have lived as peaceful neighbours so long that in our own relationships we have totally forgotten the meaning of fears and lusts for conquest that bred the war from which we have just emerged. The ripeness of our friendship is apparent for all to see in a Border which marks separate sovereignty, but binds together rather than divides. The secret is nothing other than mutual understanding and respect.

We must not over-simplify the problem. We must not delude ourselves into believing that all nations will easily achieve this broad result or that nothing more is demanded than verbal adherence to a beautiful generality. But it *can* be achieved if every nation realizes that its very survival may depend on its earnest co-operation in the peaceful settlement of disputes. All must learn that in co-operation there is giving as well as receiving. The one that eternally gives and does not receive will eventually exhaust itself. In the contrary case the recipient becomes nothing but the object of another's bounty. To co-operate we must give and take in a spirit of mutual, sympathetic understanding. Our two countries have long done it—the United Nations did it in war. The practice must continue and must become universal. When that is done the fortifications that bristle along borders throughout the world will speedily come tumbling down and from the hearts of populations will be lifted age-old burdens of fear.

Another mistake we must not make is to assume that this crusade for promoting mutual understanding can be successfully conducted exclusively by others—by the world's statesmen and political leaders; each of us, however humble, has a part to play. Governments may wisely deal with the problems which rise in our concerted search for peace, but in the end it will be the citizens of all countries who must outlaw war. Until the peoples of the world understand and respect the interests of their neighbours, the victory will elude us. Until the peoples of the world embrace the democratic belief that the dignity of the individual is the basis of the success of nations, the world will not find an enduring peace.

I venture to speak of these things because it was my lot to be intimately associated with a great co-operative effort in Europe. Success was ours because each nation was willing to submerge what might have appeared to be its own narrow interests in the common cause. A bright factor in future prospects lies in the fact that since the fighting ended there have been no futile arguments over the part that any particular one of the United Nations played. Just as each was necessary to victory, all must march together toward peace. Positive action is required. Attack, not defence, is indicated!

We have come through a momentous experience together. If it has been glorious in its achievement, it has been tragic in the lives we had to spend for success. White crosses, standing in regimented clusters throughout a thousand leagues of foreign soil, forever mark the path of victory and the price your nation and mine and our friends have paid for survival. They cry out for peace, they challenge democracy to-day. I pray, and I firmly believe, that in meeting that challenge, your nation and mine will always find themselves in the forefront of the charge.



OFFICE OF THE PRIME MINISTER
CANADA

Ottawa,
January 10, 1946

Dear General Eisenhower:

The Government of Canada has felt it would like to express to you, in its own behalf and on behalf of the citizens of Canada, its warm appreciation of your present visit to our country.

Your visit has made us all participators in the acclaim accorded your services to the world at the time of its greatest need. For adding this page to its history, our country thanks you with feelings of gratitude and pride.

We have felt that, on this occasion, we should like to give some lasting expression of the admiration and affection which the Canadian people and, in particular, the members of Canada's armed forces, cherish for you.

We could think of no manner in which to give more enduring commemoration to the world-wide acclaim you have so justly received, than by having your name given to a Canadian mountain peak of towering eminence. We felt that of all the great mountain summits of the Canadian Rockies, Castle Mountain, at Banff, in Canada's most famous National Park, would most suitably symbolize your steadfastness and the sense of security your leadership gave to the free world. We accordingly sought from the Geographic Board of Canada approval of the change in the name of Castle Mountain.

It affords me very great pleasur
inform you that the Board has approved the
proposed change. Accordingly, Castle Mount
will hereafter be known as Mount Eisenhower.
is Prime Minister, I was notified of the act
of the Geographic Board of Canada in a memor
signed by the Minister of Mines and Resources,
the Honourable J. Allison Glen.

I have much pleasure in handing you
copy of the memorandum which certifies the cha
of name of Castle Mountain to that of Mount
Eisenhower. Will you kindly accept it as a sl
memento of your present visit to Canada, and as
record of the high admiration and esteem in whi
you are held by the people of Canada.

Yours sincerely,

W. Mackenzie King

Prime Minister.

General of the Army,
Dwight D. Eisenhower,
Chief of Staff of the United States Army.

C O P Y

CANADA

MINISTER
OF
MINES and RESOURCES

O t t a w a,
January 9th, 1946

MEMORANDUM TO: The Rt. Honourable,
The Prime Minister of Canada.

The necessary action has been taken by the Geographic Board of Canada to change the name of "Castle Mountain" in Banff National Park, to that of "MOUNT EISENHOWER".

This Board, which was established by Order in Council No. 3324, of December 18th, 1897, has authority to decide upon all geographic names in Canada.

This change becomes effective as of this date.

(Signed) J. Allison Glen.

CERTIFIED: W. Mackenzie King
Prime Minister of Canada.

1946

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Right:—Mount Eisenhower and vicinity as seen from the air. Apart from its prominent location and magnificent approach, the Mountain is of special geological interest. (See chart on p. 61.)

Left:—Prime Minister Mackenzie King, when thanking General Eisenhower for his inspiring address, stated that Canadians were honoured by his visit to their country. In presenting him with the official letter and memorandum reproduced at left, he expressed, on behalf of the people of Canada, a desire to give tangible and enduring proof of their deep gratitude to the General for his services.

R.C.A.F. photo

Mount Eisenhower— *by* RALPH W. EDWARDS

Nature's Fortress in the Canadian Rockies

RISING majestically thousands of feet into the clear wind-swept air of the Canadian Rockies, Mount Eisenhower is unquestionably the predominating feature of the landscape in the area lying between the world-famous resorts of Banff and Lake Louise. The impression received by the beholder at the first sight of this mighty mountain, rearing its stupendous bulk for eleven miles along the northern boundary of the valley of the Bow River, is that it is not a work of nature but a gigantic castellated rampart erected by Titans in past eons to secure for themselves forever undisputed dominion over the broad valleys spreading out in all directions from its impregnable foundations.

Although seen and noted by such early visitors as Sir George Simpson and the Rev. Robert Rundle, Mount Eisenhower does not appear to have attracted particular attention until the arrival of the Palliser Expedition in 1857, when Sir James Hector, realizing the startling similarity between this enormous pile and the ruin of some age-old fortress, gave to it the name Castle Mountain. Not only does the mountain crest throughout its entire length maintain an almost even and level skyline, but the towering rock face appears from end to end as a stupendous wall, unbroken in its symmetrical regularity save by the occasional terrace and turret. Little imagination is required to invest this natural fortress with keep, portcullis and drawbridge, and to picture hordes of Titans surging forth to battle or the chase.

After the visit of the Palliser Expedition little is recorded concerning the Mountain until the advent of the construction gangs of the Canadian Pacific Railway in 1883-4. The valley flat at the base of the Mountain subsequently became the site of the largest camp between Calgary and the Continental Divide. The discovery of rich out-croppings of copper and galena ores on what is now Mount Eisenhower and the neighbouring ranges caused an influx of prospectors, and many claims, bearing every indication of potential wealth, were staked. Among the most famous of these claims were two on the northern ridge of the Mountain, owned by the late Col. James Walker and the late Peter McCarthy, K.C., of Calgary; throughout the entire summer of 1896 the writer was employed by the veteran outfitter, the late Tom Wilson, in packing in equipment and supplies for the opening-up of these prospects.

Notwithstanding the fact that these mineral discoveries returned assays of high values, the claims nowhere yielded any considerable quantity of ore. By 1886-7, so famous had this area become that the flat at the base of the Mountain was covered with buildings of every description and "Silver City", as the community was called, boasted a population of some fifteen hundred persons—greater than the town of Calgary at that time. But, with the realization that profitable exploitation of the mineral prospects was impossible, the many prospectors, together with the hundreds who followed at their heels, drifted rapidly away to more

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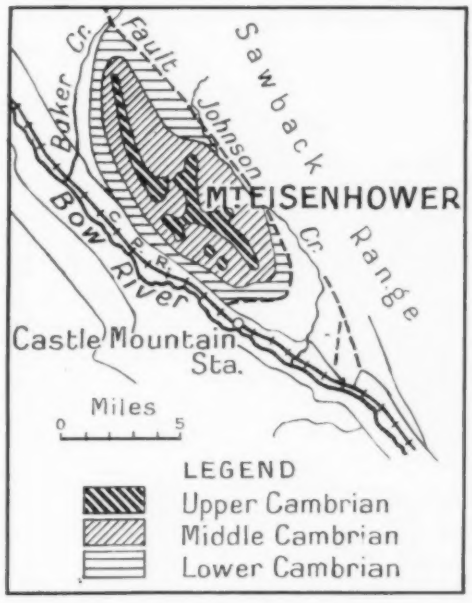
distant and alluring fields, and within a few short years not a vestige remained of the once roaring, turbulent mining camp.

Despite its outstanding prominence, Mount Eisenhower has never appeared to be particularly attractive to the mountaineering fraternity. This is probably due to the fact that, with the exception of the "Tower", which forms the eastern turret of this natural fortress, the mountain presents no dominating pinnacles or peaks; there are no snow slopes or glaciers to be negotiated and the ascent generally, owing to the non-friable nature of the rock, is comparatively safe and easy.

The first recorded ascent was made in 1884 by Dr. A. P. Coleman, of the University of Toronto, a former President of the Alpine Club. Since then a few ascents, mostly by enthusiastic amateurs, have been made. One of these attempts resulted in near tragedy. During World War I a large internment camp was located at the base of the Mountain and one of the few recreations of the military forming the camp guard was to make at least partial ascents of the mighty rock mass which frowned upon them. On a Sunday morning, in 1917, one of the younger guards announced to his comrades that he was going to attempt a solo climb of the mountain. Evening arrived, and the young mountain climber had not returned; when he was still absent on the following morning a rescue party was despatched in search of him. He was finally located perched upon a narrow ledge on to which he had dropped without first ascertaining his chances of making further progress, and from which he found himself unable to proceed either upwards or downwards. With the aid of ropes he was rescued from his unpleasant predicament and returned to camp little the worse for his nerve-racking experience. The Tower, which presents the only serious ascension difficulties, was first scaled in 1926 by Messrs. Grassi and Cerutti of Canmore, who erected a cairn on the mesa-like summit. Since then other ascents of the Tower have been made, but, though the total number of these is not definitely known, they are certainly very few.

Apart from its prominent location and magnificent appearance, Mount Eisenhower is of special geological interest. Commencing at the Gap, where the Rockies face the prairie lands, and proceeding westward, one passes through strata that appear as fault blocks in which the exposed strata are successively older than those of the preceding fault blocks on the east, until, at Castle Mountain Station, one arrives at the oldest exposed formation in the Rocky Mountains —which is of Precambrian age. This is because the uplift has been greater in the interior than in the outer ranges, and the action of denudation has consequently been greater. The result is that younger formations which at one time perhaps formed the uppermost beds of the interior ranges, have been worn away, and the old strata towards the base of the sedimentary series have become exposed. The bottom and lower slopes of Mount Eisenhower are composed mainly of Lower Cambrian quartzites, while the higher slopes are formed of Middle Cambrian and Upper Cambrian limestones and shales.

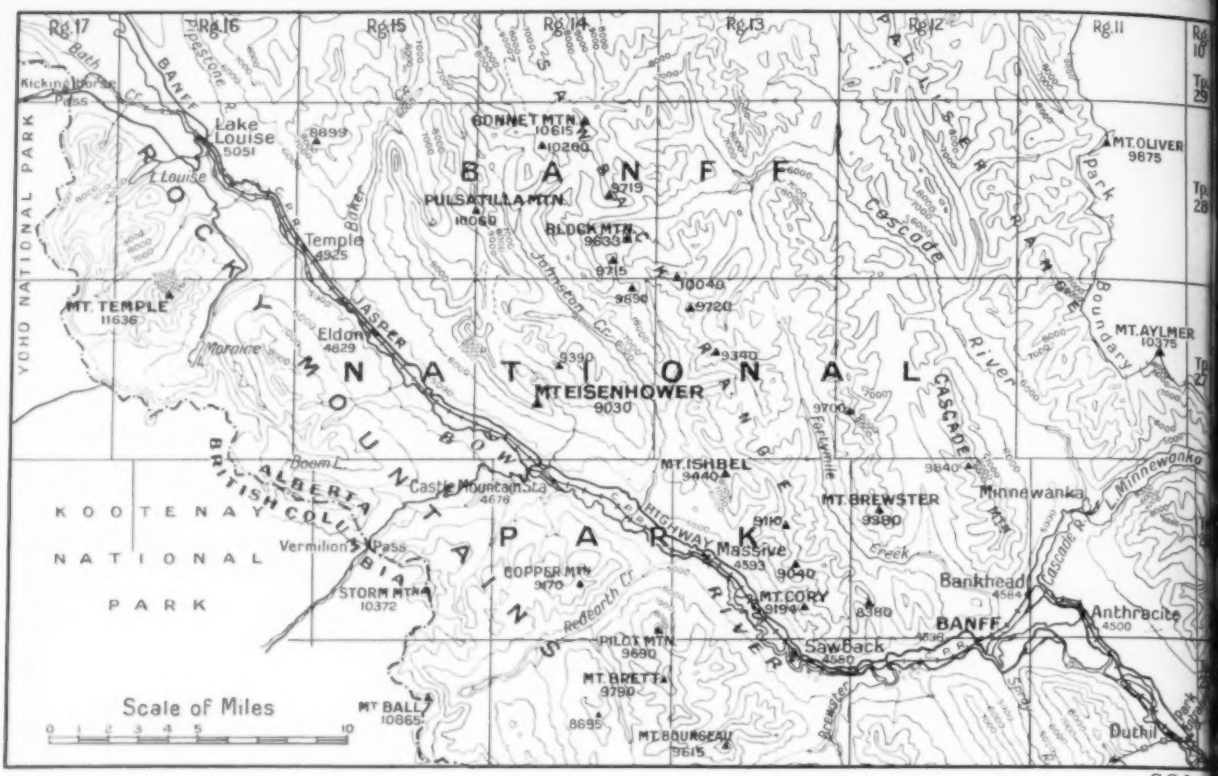
C.G.J. chart



From *Guide Book No. 8* (1913), issued by the Geological Survey, Dept. of Mines, Ottawa.

Right:—"The upper slopes (of Mount Eisenhower) are Cambrian. It is capped by the thin-bedded red-weathering limestones and shales of the Bosworth formation (Upper Cambrian). The perpendicular cliffs at the top represent the Eldon formation. This is the type locality and this formation has a measured thickness of 2,728 feet (832 m.). The Stephen formation is about 600 feet (183 m.) thick, and forms a very flat talus-covered slope, while the Cathedral formation below is about 1,500 feet (458 m.) thick and forms a precipitous slope. These three formations are Middle Cambrian in age. The Lower Cambrian beds are largely quartzitic and form brush-covered, irregular slopes."

Left:—While in Ottawa General Eisenhower autographed for The Canadian Geographical Society this unusually fine R.C.A.F. air view of the mountain named in his honour.



C.G.J.

Mount Eisenhower derives much of its attractiveness, dignity and grandeur from its magnificent setting. Although it reaches an altitude of only 9,390 feet (the Tower is some fifty feet lower), its splendid isolation gives it a distinction which even higher neighbouring peaks, such as Ball, Pilot, or even Temple, fail to attain. It rises precipitously from the broad valley of the Bow, with no other range or peak in its immediate vicinity; thus, the spectator is able to view the whole of its stupendous bulk at a single glance. This isolation is largely responsible for the feeling of the beholder that he is gazing upon the ruins of the handiwork of mighty giants of long-past ages.

The northwestern end of Mount Eisenhower looks down upon the valley of Baker Creek, where its rock wall takes a sudden drop and curves towards the north. It again rises in a ridge trending parallel to the main body of the mountain, though of considerably less height. Mount Eisenhower has, therefore, in plan the form of a gigantic horizontal U, with its curved portion facing to the west and the terminals of the northern and southern arms pointing eastward. In between the main and subsidiary ranges lies a glorious alpine valley at an altitude of nearly 7,000 feet, at the head of which is a beautiful mountain tarn. From this charming lake issues a plashing streamlet which plunges to the floor of the alpine meadow in a shimmering cascade. Thence it meanders on its long journey to mingle its waters with those of the Bow River. It is doubtful whether this mountain lake has been seen by a score of white men since the first explorer set foot in the area; it lies in its enchanting loneliness—one more instance of the many lovely scenes which are so close to the beaten path, yet whose very existence is not even suspected by the hordes of hurrying sightseers. The writer accounts himself most fortunate to have been one of the favoured few who have gazed upon the limpid waters of this mountain gem.

Like many of the notable peaks of the Rockies, Mount Eisenhower has its own particular legend. The Indians of the plains aver that its fastnesses are the home of the Chinook, the little blind daughter of the Southwest Wind. When, in winter, the soft warm wind issues from the mountain passes and in a few hours melts the deep snows of the prairie, they say that Chinook is searching for her lost parent whom, owing to her blindness, she will never find. Disappointed and saddened, she returns to her mountain home—and winter again closes down upon the world!

(National Film Board photo)

Rideau Hall, official residence of the Governor General at Ottawa, was the scene of an informal luncheon in honour of Canada's distinguished guests, General and Mrs. Dwight D. Eisenhower, during their first official visit to the capital. Shown following the luncheon, seated beneath portraits of King George V and Queen Mary, are, left to right:—Prime Minister Mackenzie King, Mrs. Eisenhower, His Excellency the Governor General, General Eisenhower, H.R.H. the Princess Alice, and Rt. Hon. Ray Atherton, United States Ambassador to Canada.

HIGHLIGHTS
OF GENERAL EISENHOWER'S
VISIT TO OTTAWA

Above:—On the third and final day of his visit to Ottawa, General Eisenhower paid tribute to Canada's illustrious dead by placing a wreath on the National War Memorial.
Courtesy Photographic Stores, Ottawa

Upper right:—General Eisenhower with the silk R.C.A.F. ensign presented to him by the Chief of Air Staff on the occasion of his visit to Air Force Headquarters.

Right:—The General inspects his Canadian Guard of Honour at the Union Station.

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Chatting with Air Marshal R. Leckie, Chief of Air Staff.

In the office of Lt.-Gen. C. F. Foulkes, Chief of General Staff

At the cenotaph, with Prime Minister Mackenzie King and Defence Minister Douglas C. Abbott

Outside the Navy Building with Vice-Admiral G.C. Jones, Chief of Naval Staff

GENERAL EISENHOWER IN TORONTO

A colourful and impressive scene in Convocation Hall, University of Toronto. Dr. H. J. Cody, Chancellor, is shown here conferring the honorary degree, Doctor of Laws, on General Eisenhower as Canada's distinguished guest is gowned by the beadle.

During a ceremony held in front of the City Hall, General Eisenhower was given freedom of the city. After laying a wreath at the cenotaph, he inspected the Guard of Honour, made up of veterans from various divisions—a representative cross-section of Canada's overseas army. In foreground, left to right, are:—Capt. A. E. Hull, Commanding Guard of Honour, Mayor Robert Saunders of Toronto, and General Eisenhower.

Charting Perils of the Sea

by F. H. PETERS *and* F. C. GOULDING SMITH

CANADA is essentially a maritime nation. As though to remind Canadians of the importance of the sea to the national life of their country, boldly carved in the stonework above the main portal of the Houses of Parliament, Ottawa, is the inscription:

> "The wholesome sea is at her gates,
> Her gates both East and West".

The ocean-lanes which gird her coasts, and the immense inland waterways which extend into the very heart of the continent, carry the products of farm, factory, mine and ocean to the markets of the world. Protection of shipping is of paramount importance. To this end much modern charting has been accomplished, detailed *Sailing Directions* have been prepared, and an elaborate system of lighthouses, buoys and wireless stations has been installed. Of all these aids to navigation none is more indispensable than the mariner's chart, for without this guide to the sea's invisible paths and shoals a ship would soon become prey to hidden dangers.

So important are charts to the safe navigation of ships, and to the promotion of waterborne commerce, that most maritime nations produce them and sell them at low cost to the mariner. Canada is to the forefront in this work, her Hydrographic Service, under the administration of the Surveys and Engineering Branch of the Department of Mines and Resources, being recognized as one of the most modern in the world. Yet few landsmen are acquainted with nautical charts and their use, and even the average mariner, ploughing through storms and heavy seas, is little aware of the vast amount of work that has been done to produce the modern charts so essential to his voyage.

The early history of the charting of Canadian waters unfolds a bleak picture of the discoverers sailing along the then-unknown coasts of the New World. As their tiny ships groped along the misty margins of the continent, the Cabots, Verrazzano, Jacques Cartier and others depicted the lay of the land on primitive charts, the line of demarcation between fact and fancy being somewhat vague. Submerged dangers of the sea they located by laborious sounding with lead and line or by the disastrous method of piling their ships on the rocks. Charting was a hit or miss affair and for centuries shipwreck was a common occurrence.

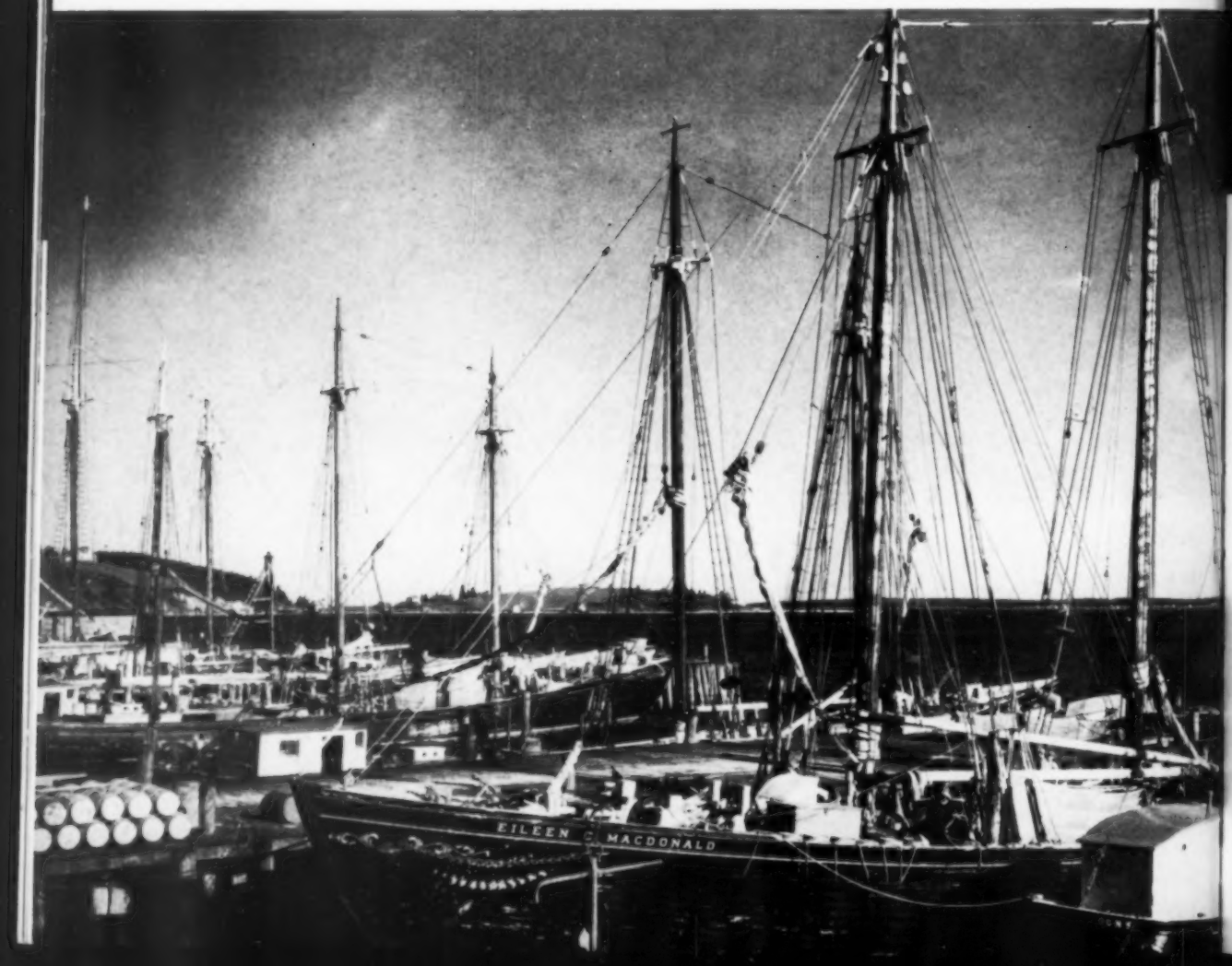
First to be explored were the most promising trade-routes, and the charts of these waters, crude as they were, were held secret. That "trade follows the flag" was a fact well recognized by the maritime countries of Europe. The successful termination of a venture and protection of a nation's own commerce were the vital considerations. For the safety of rival ships no such concern was felt to be necessary. What *was* of very special concern was the fact that charts, which showed deep channels to follow and many of the hidden rocks to avoid, would open the new water-lanes of trade to adventuring ships of other nations. "Trade followed the chart", and so charts and their supplements, the *Sailing Directions*, were guarded as state documents.

In later years, as Canada developed her own coastal and foreign trade, every inducement was made to mariners to visit her shores. The principle of marine insurance, with the present-day far-reaching consequence of *any* marine disaster tending to raise general insurance rates to all, came into effect. Availability of charts to all ships engaged in Canadian seaborne trade was recognized as essential and, as more and more demands were made on accurate cartographic detail, outmoded and outdated charts were gradually replaced by others

based on more reliable surveys. Contributing to this later phase of charting was a galaxy of pioneer hydrographers, amongst whom might be cited Captain James Cook, R.N. This famous English navigator was employed in charting the St. Lawrence River, and published a chart extending from Quebec to the sea. In 1763 he was appointed marine surveyor of the coasts of Newfoundland and Labrador, in which arduous service he continued until 1767. Captain Vancouver, who received his early training under Captain Cook, charted considerable areas on the Pacific Coast. Others, whose charts to-day are their finest monuments, gave their lives to the exploration of our northern regions.

When the nautical charts of that early period are subjected to the light of modern hydrographic knowledge, their most apparent fault is found to be one of omission rather than commission. Hundreds of uncharted shoals have since been found—any one of which was a potential source of marine disaster. Though this deficiency was later of grave importance, it was not a blot on the escutcheon of the early hydrographers. Our coast, much of it reef-bordered, bristling with pinnacle rocks and shrouded in mists, is exceedingly difficult to chart, even under the best of conditions. Time, equipment and expense were important factors in their day, and deep-draft ships such as we have now were undreamt of, even a hundred years ago. In consequence, certain depths that are now a real menace to deep-draft vessels were then considered safe and were not minutely charted. The charts of that period served

Lunenburg fishing fleet which, year after year, gathers rich harvests from our marginal seas.
(National Film Board photo)

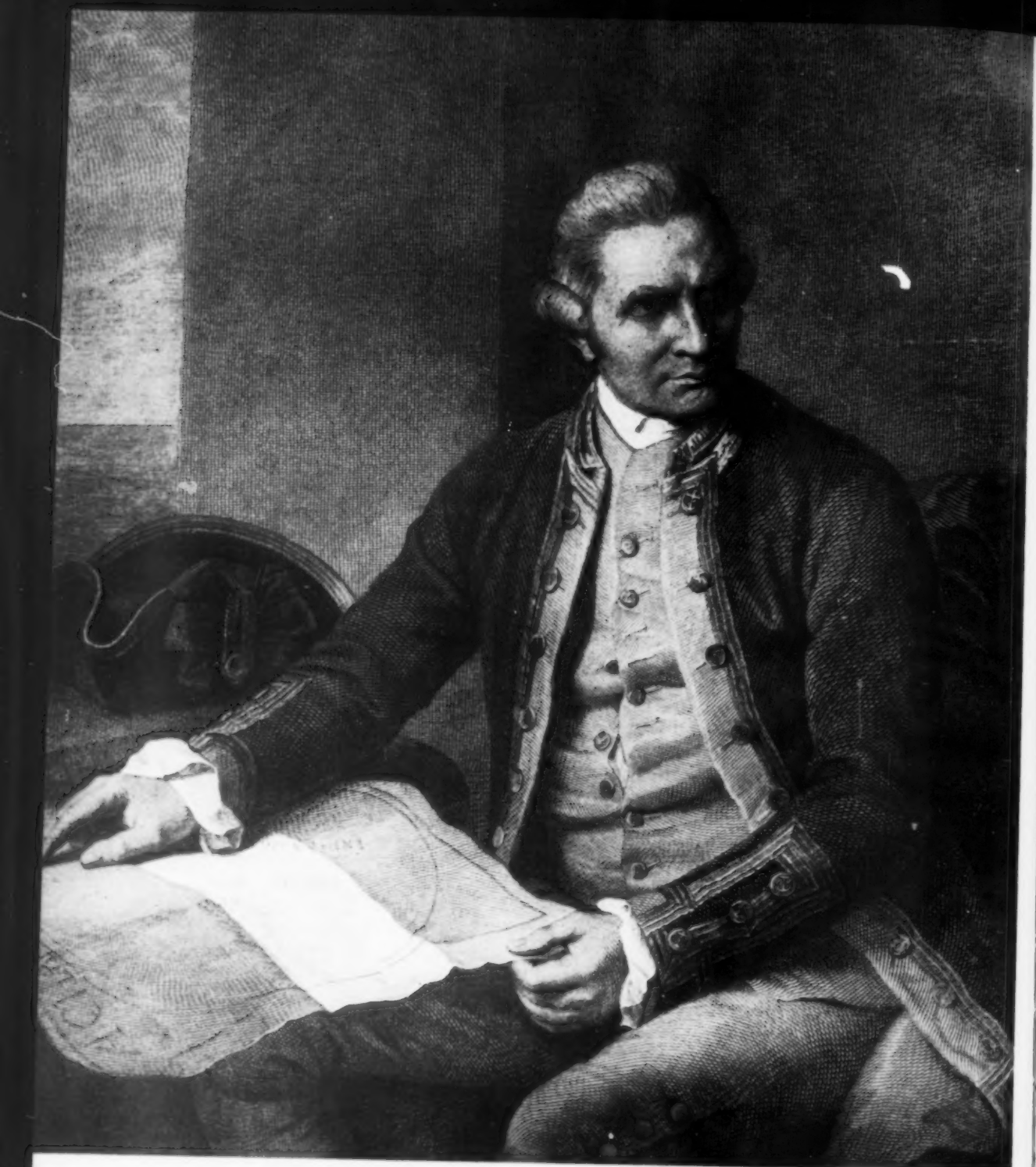


A British Columbia fishing vessel, commissioned by the Royal Canadian Navy, plunges through choppy seas on coastal patrol duty. The commercial fishing fleet, always in search of new fishing grounds, and making use of every nook and cranny in the coast for harbourage, is an extensive user of Canadian nautical charts. (National Film Board photo)

the great days of sail, and, like the ships of that colourful period, have all but disappeared.

In the early part of the nineteenth century the real industrial development of Canada began and, synchronizing with this, the British Admiralty undertook a more or less systematic charting of our waters. The excellent charts which their hydrographers produced are testimony to the value of their labours. Amongst the outstanding marine surveyors of that day, Bayfield was perhaps the greatest. Until a few years ago *Bayfield Charts*, made as a result of surveys conducted from 1817 to 1857, were known to every sailor from the Great Lakes to the sea, the whole of which great stretch of waterway was delineated on his charts—a remarkable accomplishment for one man. As late as 1910, Admiralty hydrographic vessels were engaged in charting Canadian waters, and many coastal and outlying sea-areas are covered exclusively by their charts.

An important chapter in navigation in Canada began in 1882, when a series of marine disasters on uncharted shoals in the Great Lakes culminated in the wreck of the *Asia*, which perished in Georgian Bay with great loss of life. This caused a public outcry for accurate nautical charts, and the Government, realizing that mercantile development depended on the safety of shipping,



The charting of Canadian waters has been a gradual and painstaking process. Many outstanding hydrographers have contributed to the work. Captain James Cook, R.N., 1728-79, the great British explorer, conducted charting operations from Quebec to the sea.

(From an engraving in the Public Archives of Canada)

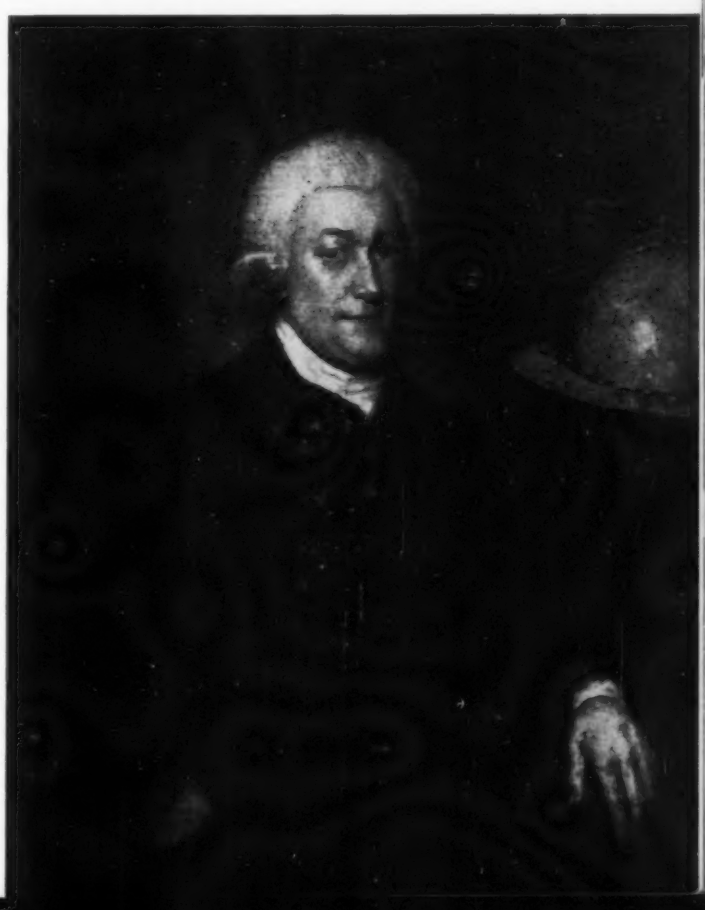
and also that the work of charting Canadian waters was a Dominion responsibility, organized what is known to-day as the Hydrographic Service of Canada. At the time of the inception of this Service no Canadians experienced in the science of hydrography were available, and so arrangements were made with the Hydrographic Branch of the

British Admiralty for the loan of Captain J. G. Boulton to conduct charting operations under the administration of the Dominion Government.

This officer carried on for many years, produced a number of charts, and trained understudies in the methods and standards of the parent service. His first assistant, a brilliant young Canadian, later to become Chief Hydrographer of Canada, was W. J. Stewart. In course of time others became skilled in the profession, nautical charts were prepared and printed in Canada, and a high standard of marine cartography was attained in all phases of the work. As a result of the co-operation between the Canadian and British Hydrographic Services, it was most natural that during the first Great War a number of young Canadian hydrographers found their logical places as commissioned officers on Admiralty hydrographic vessels operating in the North Sea, English Channel and Mediterranean Sea. The close contact established through Captain Boulton, and renewed overseas by these representatives of the Canadian Service, has been maintained in increasing extent to the present day.

The objectives of hydrographic work the world over are very similar. Dissimilarities are chiefly in the methods and equipment used, and in the physical conditions under which actual charting is carried on. In Canada important factors in the planning, administration and conduct of hydrographic work are the wide differences which exist in the character of our coasts and navigable waters, in climatic conditions, in coastal mercantile development and in strategic war importance.

Widely varied, also, is the character of shipping in Canada that must be provided for: the deep-draft greyhounds of the Atlantic and the fishing schooners from Lunenburg; the ice-sheathed patrol vessels of the Arctic and the tramp steamers on the Hudson Bay Route; the long grain-carriers of the Great Lakes and the expensive tourist yachts which holiday in Georgian Bay; the shallow-draft stern-wheelers on the Slave-Mackenzie Rivers; the luxury liners of the Pacific; and, lastly, but of very great importance to the economic life of this country, the commercial fishing craft which weave their precarious ways through rock-infested waters of the British Columbia Coast. The individual needs of all these classes of shipping must be met. Up-to-date nautical charts are a first requisite, official *Tide Tables* are essential and volumes of *Pilots* and *Sailing Directions* covering all coastal and inland waters must be made available. The production of these basic hydrographic aids to navigation requires that throughout the length and breadth of our great waterways every mile must be surveyed, every depth sounded, every rock on which a ship might founder must be discovered.



Captain George Vancouver, R.N., 1757-98, famous English navigator and hydrographer. A number of nautical charts of our British Columbia Coast and of the island which bears his name were in use until recent years.

(Courtesy Public Archives of Canada)

Accurate charts are required for navigating the rock-strewn waters of Barkley Sound, British Columbia. (R.C.A.F. photo)

The immensity of the task which confronts the Hydrographic Service can best be grasped by a realization of the vast extent of our coastal and inland waters, and of the many perils of the sea which, if uncharted, would constitute a terrible menace to navigation. Let us look at the charts. The coasts and navigable waters of this country are amongst the most extensive of any nation's in the world. The salt-water shores, including their gulfs, bays, inlets and off-lying islands, measure some 50,000 miles. This figure is only approximate, as the mileage varies very considerably according to the closeness with which the sinuous shore is followed. Of this total, the mainland coast accounts for 15,000 miles, the Arctic Islands 27,000, and other islands, including Anticosti, Vancouver and the Queen Charlottes, 8,000. Added to this is the long Canadian portion of the Great Lakes-St. Lawrence Waterway, the navigable rivers, including the Mackenzie River route to the Arctic, and the lesser Great Lakes: Winnipeg, Athabaska, Great Slave and others of importance but less extensive.

In dealing with the manner in which Canadian hydrographic surveys are carried on, a brief sketch descriptive of the western and eastern thresholds of the Dominion may be of assistance. Space will not permit a hydrographic description of the Canadian portion of the Great Lakes-St. Lawrence Waterway. Nor can we deal here with the present charting of Great Slave Lake and the Mackenzie River route to the Arctic—more than a thousand miles of almost uncharted waters. In recent years, partly to meet war demands and partly to meet anticipated demands of post-war shipping, actual charting operations have been confined chiefly to strategic areas on the Pacific and Atlantic Coasts.

Of all our navigable waters, one of the most interesting regions to chart is the British Columbia seaboard. There considerable hydrographic work has been accomplished, but extensive areas are, at best,

Typical of many island-studded areas is the entrance to Jervis Inlet, British Columbia. (R.C.A.F. photo)

only sketchily surveyed. The rugged coasts are pierced by numerous tongues of the sea which wind for many miles through mountainous country. Like the fjords of Norway, these great inlets branch into many offshoots and ramifications. The mainland and islands have many fine ports and commodious anchorages. Several natural harbours of refuge, previously little known and furrowed only by the keels of local fishing boats, have proved of inestimable value for naval purposes, but before they could be used for the deep-draft ships of war, modern detailed charts had to be made. Between many of the islands strong tides sweep back and forth, in some cases rendering dangerous otherwise good passages. With a knowledge of the movements and times of the tides, which it is also the duty of the Hydrographic Service to provide, much of the strength of the currents can be avoided.

Behind the great barrier of islands which protect it from the sea is the unique Inner Passage, used in peacetime by palatial vessels from Vancouver and Seattle and, since the outbreak of war, by ships of the Allied navies bent on more formidable tasks. The channel is mostly deep, hundreds of fathoms in places, but in other localities pinnacle rocks rise to within a few feet of the surface in narrow defiles. "Still waters run deep" is not always true, as a glance at the charts will show.

Bordering the islands and mainland are some of the most shoal-ridden stretches of water imaginable, most of the rocks being marked only by Nature's seasonal buoy of kelp. The submerged continental shelf from which they rise is as rugged and deeply-ravined as the mountainous coast itself. This under-sea feature, which, in a sense, marks the transition from land to ocean deeps, projects from 4 to 45 sea miles off Vancouver Island and 1 to 15 miles off the Queen Charlottes—or, in round figures, 50 to 100 miles off the mainland. The depth at the outer edge of the shelf is about 200 fathoms and here the ocean floor drops suddenly to

Along the Atlantic seaboard the mountain ridges dip down into the ocean. Submerged valleys form the inlets; summits reappear as scraggy rock islets or as dangerous shoals many miles from land.
(National Film Board photo)

abysmal depths. This zone must also be charted to assist vessels in determining their positions off the coast.

The Atlantic Coast of Canada is serried with bays, estuaries and secure harbours. It is fringed by rocky islets and dangerous reefs which uncover at every stage of the tide. Still other dangers are disclosed only by the green swirl of the sea above them, and many more perils come to light as modern hydrographic surveys progress along the coast. Fourteen miles off the southwest coast of Nova Scotia lies a shoal with only 1½ fathoms (9 feet) of water over it at low tide. It has been well charted, and in the fog and turmoil of its waters a lightship stands guard. Otherwise, the Lurcher Shoal would constitute one of the most formidable dangers to navigation on the whole Atlantic seaboard.

On this storm-swept coast, the names of many ocean features reflect the nature of the waters and the wild play of the sea against the rocks. Listen to these; the very sound and roar of the ocean is in them: Boom Rock, Thrumcap Rocks, Snorting Rocks, Brig Rocks, Roaring Bull, Shagroost, Bassoon Reef—to mention only a few taken at random from the nautical charts.

Our whole Atlantic seacoast has a wealth of such descriptive and boisterous sea-names: Flying Point, Whitehaven, Tom Cod Shoals, Black Peg Shoal, Yankee Jack, Neverfail Shoal, Three Fathom Harbour,

Hardy fishermen on the Gaspé coast go out after their catch in all kinds of weather. The fisheries of the Province of Quebec are amongst the most extensive in the world.

(Nationa Film Board photo)

Drunken Dick, Ironbound Island, Mad Moll Reef, and others as colourful. The hard life of a sailor makes him a realist; such names are vivid and expressive, and, once heard, are never forgotten. In some cases, memory is the seaman's chart and old rhymes are his "Sailing Directions". Farther north, still sings the Newfoundland skipper, as he steers his ship through the "tickles" (narrow straits):

"When Joe Bett's Pint you is abreast,
Dane's Rock bears due West,
West-nor-west you must steer
'Till Brimstone Head do appear.

"The tickle's narrow, not very wide;
The deepest water's on the starboard side,
When in the harbour you is shot
Four fathoms you has got."

Charting on our Atlantic seaboard is made more difficult by fogs, which are of frequent occurrence. Storms, fortunately, do not occur in early summer, but after the middle of August gales of great strength may be expected, and the hydrographer then must watch his barometer. A falling glass portends heavy weather; a rising barometer generally brings clearing skies. As on our Pacific Coast, a heavy ground swell rolls in from the sea, and, when charting, quick minds and nimble feet are necessary to avoid getting a wetting when landing on the rocky shores.

The irregularities of the ocean floor offlying the Maritimes form ravines and also the plateaux which constitute the richest fishing banks in the world. Probably the best

known are Grand Banks, Green Banks, St. Pierre Bank, Banquereau, Sable Island Bank, Browns Bank and Georges Bank. Sable Island, keeping lone sentinel 90 miles off the Nova Scotia Coast, is the dry top of a great submerged ridge. In its vicinity the water everywhere is shoal, five fathoms being found nearly a mile off the shore. The sea breaks heavily on the surrounding bars, and the shores of the island are literally lined with the wreckage of ships that have come to grief on the treacherous sands. On many of the Nova Scotia Banks, and in the deep passages between, comparatively few soundings have yet been obtained, and for this reason hydrographic publications warn the mariner not to put too much reliance on a position assumed from depths alone. Owing to the great amount of ocean traffic in this vicinity, and to the large number of fishing craft that anchor on the banks, the principal steamship companies have agreed to use certain lane routes which have been laid down for different periods of the year.

Because a very slight error in the charted depth of a shoal or in the designated position of a buoy or lighthouse might be a source of grave marine disaster, modern hydrographic surveys are made with the greatest care. Every line in the delicate tracery of the chart is the result of detailed measurement and precise calculation. The thousands of tiny depth figures that constitute the chief feature of these basic aids to navigation are selected from countless soundings which, in many cases, have been taken under severest weather and sea conditions. A wide range of technical operations enter into the construction of a chart, those performed at sea being broadly outlined under the following headings:

(a) Triangulation and astronomical observations
(b) Sounding, sweeping and examination of shoals
(c) Coastlining and topography
(d) Observations for magnetic variation
(e) Tidal and current examinations and certain oceanographical studies
(f) Compilation of navigational notes for preparation of *Sailing Directions*
(g) Drafting of the field sheet

A thorough knowledge of seamanship and navigation is essential. Skill in the use of modern nautical instruments is as necessary as is familiarity with the more prosaic equip-

Lighthouse Point, Louisburg, Cape Breton Island, charted by the Hydrographic Service of Canada. This rock-bound coast is open to the full sweep of Atlantic storms. (R.C.A.F. photo)

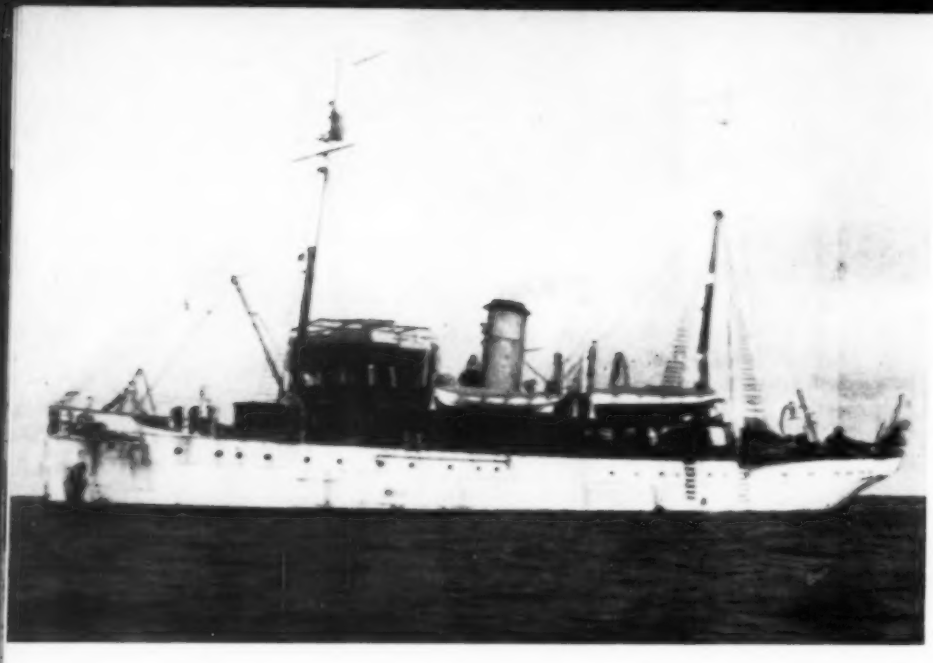
Sable Island—"Graveyard of the Atlantic" (R.C.A.F. photo)

ment of the land surveyor. To be a navigator one need not be a hydrographer, but to be a hydrographer one must be a navigator.

The floating equipment of a major hydrographic survey unit in Canada consists of a surveying vessel such as the hydrographic steamer *Acadia*, which for many years has contributed to the modern charting of our Atlantic and northern waters. Another vessel, one of the most modern of its class in the world, is the *Wm. J. Stewart*, which was built at Collingwood, Ontario, for work on our Pacific Coast. Since the inception of the Canadian Hydrographic Service, other ships which have served their day in charting our inland and coastal waters were the *Bayfield I* and the *Canadienne*, both, in bygone days, familiar to many on the Great Lakes-St. Lawrence Waterway. Later, the *Bayfield II* continued the work in the Great Lakes and, with the well-known *Cartier*, conducted charting in the estuary and Gulf of St. Lawrence. Until a few years ago the hydrographic steamer *Lillooet* served on the British Columbia Coast, and many a modern chart resulted from her work.

Amongst the smaller craft which gave yeoman service were the *Chrissie Tolmie* in James Bay and the *Restless* and houseboat *Somass* in the Pacific. Of the older surveying launches still in use, mention might be made of the *Boulton* on the St. Lawrence and the *Henry Hudson*, lately of Hudson Strait and now in the Gulf. Supplementing the work of charting in the more sheltered passages on the Pacific is the survey-houseboat *Pender*.

The *Acadia*, alluded to above, is a typical hydrographic vessel which has proved her worth all the way from the storm-swept waters of the Bay of Fundy to the ice-fields of Hudson Strait and Bay. She is about 170 feet in length, with displacement 1,710 tons, breadth 33.7 feet, draft 12½ feet and speed 8½ to 11 knots. Her ordinary complement comprises six or seven hydrographers and a crew of about 42 required to man the ship and assist in surveying operations afloat and ashore. As on all modern hydrographic vessels, normal equipment consists of the latest types of navigational and hydrographic instruments, gyroscopic compasses, wireless direction-finding apparatus and, of course, echo-sounding gear. In the ship's lockers are delicate oceanographical instruments used for the study of tides and tidal currents and for the determination of sea-salinities and other data of navigational importance. Carried on deck are several stoutly built motor-launches equipped with sonic-sounders for charting the inshore waters. Designed as they are with spacious chart-rooms and fitted with modern instruments, hydrographic vessels are scientific workshops. Well they might be, for the shoal-infested regions in which they operate present technical and navigational problems elsewhere unsurpassed.



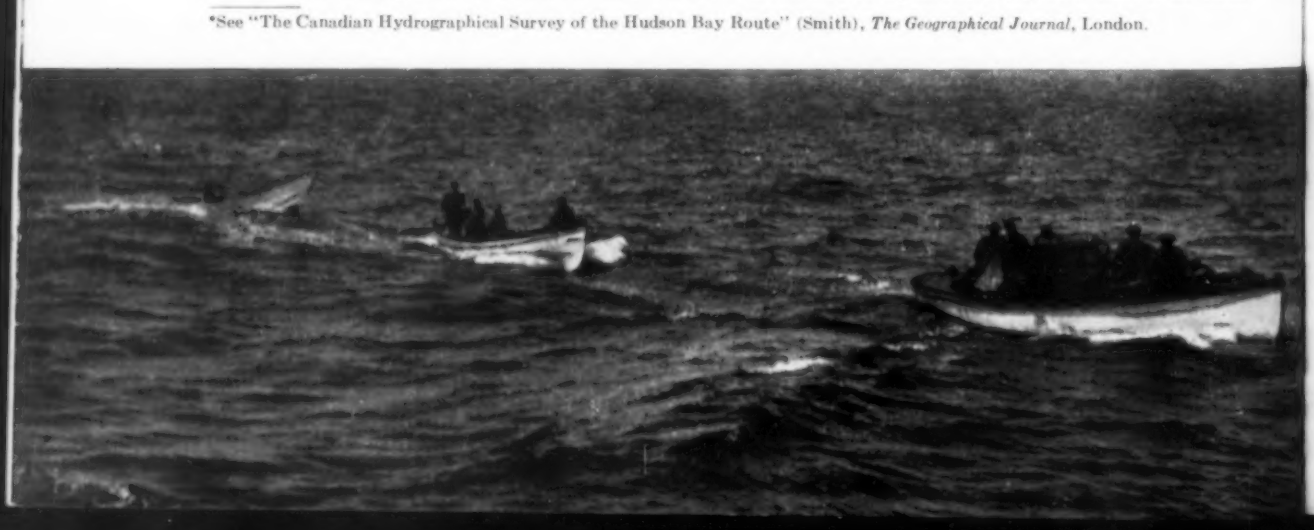
Canadian Government hydrographic ship Acadia

In order to get a more comprehensive view of the actual work of charting at sea, let us start out with a Canadian hydrographic vessel from Halifax, Victoria, or wherever her home port may be. The ship has been overhauled during the winter and, after fitting-out, is ready early in May to sail for the season's charting grounds. The navigation course has been laid down and, following that route, the ship arrives at the proposed scene of operations. The work of charting proceeds from where it terminated the previous year.

The day's activities at sea commence at seven o'clock (six bells by the ship's clock) when each assistant is assigned to a specific division of the work. If the survey is in the earliest stages, the erection of triangulation beacons on the coast, and the measuring of angles to determine their positions, will occupy the hydrographers for several days. This main triangulation controls the whole survey, and on its accuracy depends much of the integrity of the chart. Wherever possible the charts of the Canadian Hydrographic Service are based on the finely adjusted geographic values supplied by the Geodetic Service of Canada, but in certain outlying localities, such as Hudson Strait, which are not yet embraced in that precise triangulation framework, the hydrographer himself determines the geographic basis of his chart by a series of astronomic observations for latitude, longitude and true bearing.* While the work of triangulation is proceeding, numerous subsidiary marks, prominent summits and conspicuous features, such as lighthouses, if any, are observed and tied into the survey. These are used later when delineating the actual coastline, and they serve as landmarks for fixing the positions of the vessel when sounding many miles from shore.

When station-building and triangulation are sufficiently advanced, one assistant with

*See "The Canadian Hydrographical Survey of the Hudson Bay Route" (Smith), *The Geographical Journal*, London.



a crew of three or four sailors, may leave the ship in a small boat to survey the coast. This work is called coastlining and consists in mapping the meandering high-water line, the bays, points, headlands and all that pertains to the topography of the shore. In recent years this phase of charting has been greatly speeded up by air-photography. Complicated portions of our coast, which heretofore would have had to be surveyed laboriously almost yard by yard along the shore, are now accurately delineated in a fraction of the time through the co-operation of the Photographic Division of the R.C.A.F.

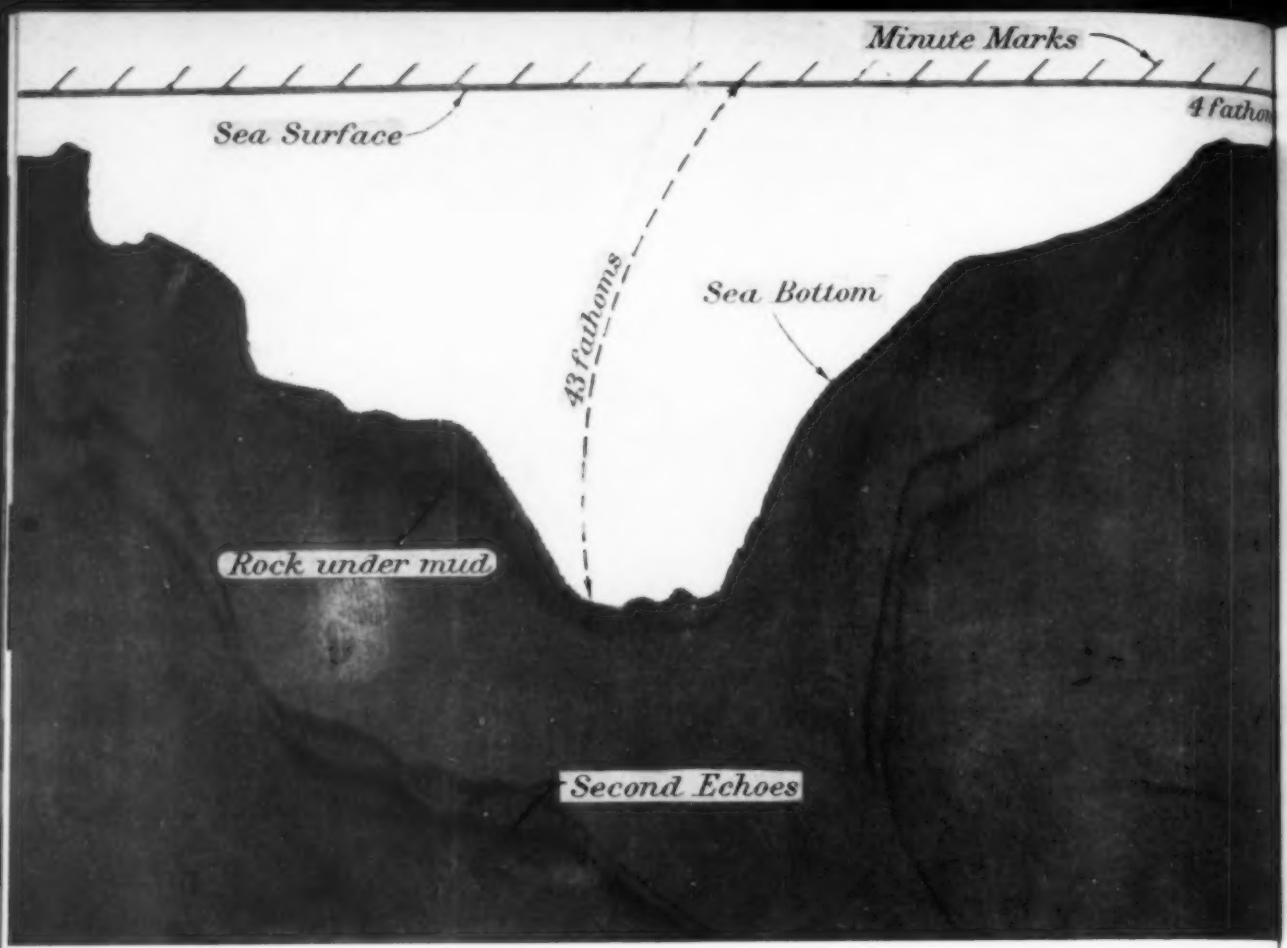
A chart might be described as a marine map intended for the use of seamen. The principal difference between a map and a chart is that whereas a map *must* show the land features and it *may* show those of the water, a chart *must* show the water features and it *may* show those of the land. In other words, the most important part of a mariner's chart is the water area—the depths, reefs, shoals and banks, as well as the channels which clear them. The forms and contours of the sea, river or lake bottom are ascertained by constant sounding. In hydrographic work, as in most sciences, old methods give way to new but nowhere has progress been more pronounced than in the method of obtaining depths. For this purpose, the old hand-lead method has given way to automatic echo sounding. With the use of this modern instrument, far greater accuracy, and incomparably greater economy, have been effected.

Top to bottom:—Launches equipped with echo-sounding instruments are carried aboard hydrographic ships for work in inshore waters.

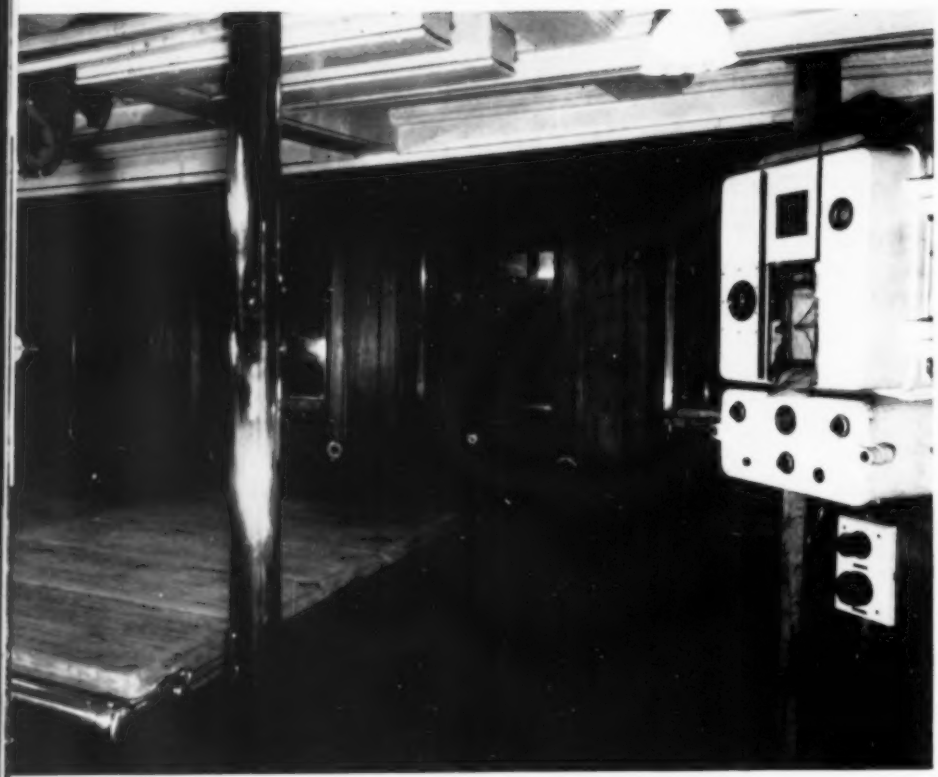
A leadsman sounding from the chains aboard a hydrographic ship.

Canadian Hydrographic Survey launch Boulton
(Photo by S. R. Titus)

Left:—Hydrographic boats which have been engaged in charting inshore waters return to their ship at the close of day.



Echo-sounding record



Chartroom and echo-sounding equipment on the Acadia

The modern method of measuring depth by sonic-sounding depends on knowing the rate of sound-travel in water, and on measuring the time interval from the moment a resonant sound is emitted from the hull of a ship until the echo is received back from the bottom. Much the same principle is involved in finding the distance that a ship is off shore, a method much used at night and in foggy weather in canyon-like inlets of the British Columbia Coast. In the latter case the sound wave races to the cliffs, and is there reflected back to the vessel. The exact times of departure and arrival are noted and, since the velocity of sound-travel is known, the double-distance is easily calculated. The main difference between the principals involved in sonic-sounding and in distance-finding by echo is that one is based on the velocity of sound in water, the other on the rate of sound-travel through air.

Speed and efficiency are important factors in navigation, but safety is the first rule and sounding is a primary means of attaining it. In the early days of echo-sounding, many shipmasters looked askance at the new device—and confidently at their familiar leadlines. The sling and stone of the shepherd was once preferred to the then unproven armour of a king. Elementary as was depth finding by means of the tried and trusty leadline, certain precautions had to be taken to assure accurate soundings. One of these was to ascertain that at each cast the sounding lead had reached bottom. In order to prove this, and to ascertain the nature of the sea-floor, a piece of tallow was pressed into a groove in the business end of the lead so that on striking bottom the tallow would pick up a sample—whether sand, shell, pebble, coral, clay or the impression of solid rock. It was necessary, also, to make sure that at the time of taking the sounding the leadline was in an upright position and not bowed by the current or trailed in the wake of the vessel. To-day, with echo-sounding, there is no need to doubt the accuracy of the depth obtained. So sensitive are the instruments that the slightest irregularity of the bottom is detected and echoes can be obtained even from schools of fish. Indeed, many fishing vessels have sonic-sounders for this express purpose. But, so long as a sea-captain in reef-infested waters calls for the depth of water under the keel of his vessel, so long will the ancient leadline be standard equipment.

A Nova Scotian "banker"

The Canadian Hydrographic Service was amongst the first to adapt the sonic method of sounding to charting purposes. Some of the earliest experiments in obtaining echoes from the sea-bottom were carried on aboard the Canadian Hydrographic ship *Cartier* in

On the navigation chart, laid out before him in the chart-room, an officer of a Canadian merchantman plots the ship's position

(National Film Board photo

the Lower St. Lawrence as early as 1915, the whole idea of sounding by echo being, at that time, very much in the embryo stage. Seventeen years ago the Canadian Hydrographic ship *Acadia* was fitted with a sonic-sounding instrument and soon after this became standard equipment on all hydrographic launches.

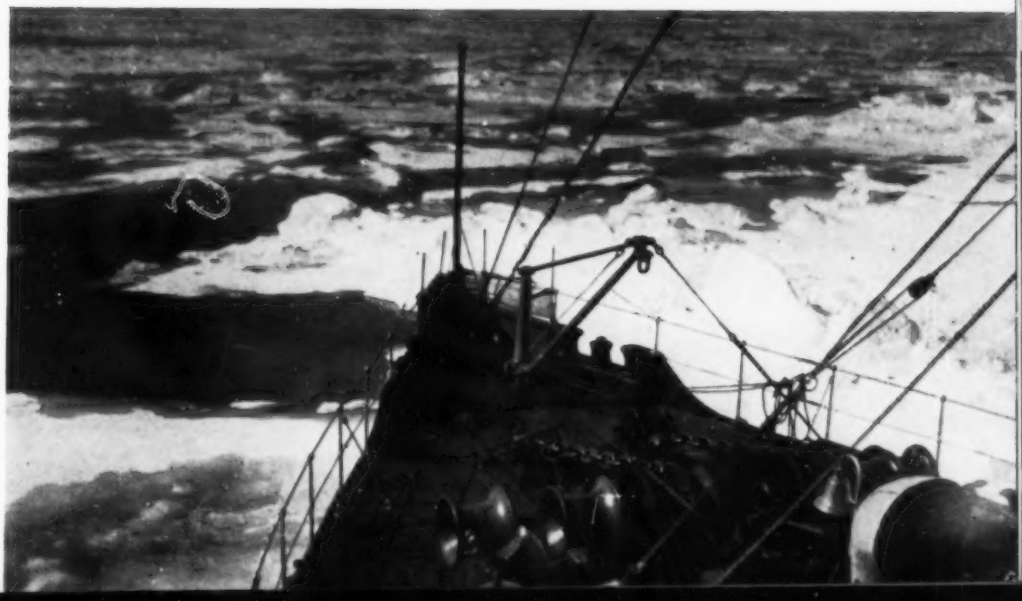
Launch-sounding at sea is full of action. If the sea is not too rough to permit it, a motor-boat is lowered from the ship and speeds to her sounding grounds, usually the inshore waters along the coast. The sounding party is made up of two hydrographers and a small crew consisting of engine-driver, helmsman and sounder. Before the advent of echo-sounding, the leadsman stood in the sounding chains, forward of amidships, and, as the boat was carefully steered in and out from the shore on parallel ranges, he constantly took casts with the lead, and called out the depths in fathoms and feet—"five-four", "seven-two", "one-three", and so on. In depths too deep to allow the hand-lead to reach bottom while the launch was moving ahead, the boat was stopped at intervals to obtain soundings by means of a heavy lead attached to the end of a coil of fine piano-wire wound on a reel.

To-day, launches equipped with the modern echo-sounding instrument can record depths graphically and continuously, even while running at full speed. At frequent intervals, with the use of that most valuable instrument, the nautical sextant, the surveyors in the launch "fix" its position by taking angles to shore landmarks. On the plotting table lies the sounding board and on it the surveyor marks the "fixes" and so directs the helmsman the course to steer.

When sounding, hydrographers determine the positions of the launch by sextant fixes to shore landmarks.

Oceanographical work is an important function of the Canadian Hydrographic Service.

Examination of a shoal from the ship's "gig" — a method much used in earlier days.



Heavy plating and bow reinforcement enable the Canadian Government hydrographic ship Acadia to work in ice-strewn waters.

Picturesque Indian Cove, Nova Scotia. The serried coastline of the Atlantic provides harbours for great numbers of small craft which fish in the rock-strewn inshore waters.

(National Film Board photo)

For nearly a century mariners in the Gulf of St. Lawrence have charted the positions of their ships by bearings to Cap des Rosiers light. Here also is located a fog-horn and a marine signal station. Storm warnings are hoisted; the cone, apex up over the cylinder, predicts a heavy westerly gale.

(Courtesy Aids to Navigation Branch, Department of Transport)

Day by day the work of boat-sounding goes on. In heavy weather the little launch is tossed about, but, generally speaking, the only signal for giving up is either the sea drenching the surveying instruments and plotted work, or fog and rain obscuring the landmarks.

So much for the shore and boat work, but the parent ship also engages in active operations. Her responsibility is the charting of the distant, off-lying areas. As the vessel cautiously steams ahead on her long sounding-lines, a hydrographer watches the depth graph, takes notes, and observes the manner in which the rises and undulations of the bottom take on different forms and shapes. Extremely interesting it is, and sometimes breath-taking, to watch results as the sound waves probe the secrets of the sea-floor and the graph brings to light hitherto unsuspected dangers. On a hydrographic vessel whose main duty it is to venture into uncharted waters, the dread call — "breakers ahead" — is not uncommon.

Though the ship may be out of sight of land, the exact location of every sounding must be determined. For this purpose many ingenious devices have been invented: buoy-control, taut-wire control and radio-acoustic-ranging, to name only a few. Most of the apparatus is as cumbrous as these names suggest, and the technical application too involved for description in a short article. Suffice it to say that, for the purpose of ship-location, the Canadian Hydrographic

Bird Rock, situated close to the main steamship lane in the centre of the Gulf of St. Lawrence, is one of the most lonely spots in the world. Sea birds nest in every cranny and ledge of the rock, and their cries mingle with the crashing of the waves against the cliffs. Before the days of radio communication, tragedy was written large in the history of Bird Rock Light Station.

(Courtesy Aids to Navigation Branch, Department of Transport)

Canadian Government hydrographic steamer Wm. J. Stewart *off the Queen Charlotte Islands, British Columbia. White survey beacon with flag may be seen on small islet in right background.*
(R.C.A.F. photo)

Service is keenly interested in the latest developments in the general field of radar, to which this country has made outstanding contributions.

In recent years the science of navigation has developed rapidly. To-day the gyro laughs at the vagaries of the magnetic needle and radar and loran locate the position of a ship when out of sight of land. Sonic-sounders record hundreds of depths where only one could be taken before. The artificial steersman, "Metal-Mike", replaces the salt-crusted shellback who boasted to his mates:

> "I was born in the cross trees,
> My hair is rope yarn,
> Every finger is a marlin spike,
> Every bone a capstan bar
> And every drop of blood is Stockholm tar."

In an age when competition in shipping is so keen that every hour of extra steaming may make all the difference between profit and loss, ships are obliged to cut corners and hug the shallow shores in a manner sometimes to be deprecated. Modern navigational inventions greatly contribute to the safety and efficiency of navigation, but in no way do they replace the need for hydrographic aids. On the contrary, fundamental to the use of each device is the standard nautical chart. For this reason, navigation to-day makes more demands on the integrity of the chart and renders its indispensibility the greater.

Year by year the work of charting goes on. Much has been accomplished, but a great deal remains to be done. In certain localities, notably in the Gulf of St. Lawrence and in estuarial and riverine parts of the coast, the configuration of the bottom is continually changing as the sea and currents nibble away part of the shore and pile the sand up in bars at other places. This can be seen in the Magdalen Islands where the sea has carved the red-sandstone cliffs into

Coastal shipping in Johnstone Strait, British Columbia (R.C.A.F. photo)

fantastic shapes. As the ocean-swells thunder and swirl into the deep caverns, clouds of rising spray erode and wash away the land, only to deposit it elsewhere. It is only by constant vigilance that the charts of such regions can be kept up to date. As a parallel case might be cited the British Isles, where four Admiralty hydrographic vessels are continually engaged in recharting "home waters".

In most parts of Canada the economical length of a charting season extends from May to November. Then come days of gales, sometimes weeks of fog and rain. Hydrographic work at sea becomes more and more difficult to accomplish. Eventually orders are given for the ship to proceed to her base. There, the crew is paid off and the hydrographers return to headquarters to prepare new charts from the results of their season's work. But that is another story.

Scots Lovat Scouts crossing the Athabasko River during the winter of 1943-44 while training at Jasper, Alberta, for the invasion of Europe. These mountain troops were using the amphibious American snowmobile called "Weasel". Pyramid Mountain is in the background.

Winter Manoeuvres in Canada

by J. TUZO WILSON

Photos by courtesy of Canadian Army Public Relations and National Film Board

IN WARTIME the advantages of surprise over an enemy are so great that military security demands that many things which would prove useful in civilian life be kept hidden from the public. At the conclusion of hostilities the need for secrecy diminishes and stores of great and secret developments which have taken place over years of time are quickly released to a public so unaccustomed to the new discoveries that it is only slowly able to comprehend the changes wrought. Just as with radar and atomic energy, so has this been the case in a host of lesser developments. This article is a brief summary of work done in Canada during the war in one of these minor fields: the development of vehicles, equipment and methods suitable to a cold climate. Although this has been but a small part of the war effort, it is a part that may prove of consequence to commerce in our own cold country. With the military need for security

gone, the services can reveal the progress that has been made. It would require several articles to outline the improvements made in clothing, rations, or in winterizing vehicles and aircraft. This one is chiefly devoted to the story of test manoeuvres by the Canadian Army.

The extent to which World War II has been fought in the cold is sometimes forgotten. During this war Canadian troops have landed on Iceland, on Arctic Spitsbergen and on the bleak Aleutian Islands. Later they fought without adequate preparation throughout an unusually severe winter in the Apennines and in Northwest Europe. In addition, British and American troops fought in Greenland and Norway, while extensive preparations were made for a large-scale invasion of Norway and for an assault through the Alps.

Some of the greatest achievements of the Russian armies are well known to have been winter victories. Deep snow and biting cold were allies of the hardy Russians when they stopped the Nazis before Moscow, Leningrad and Stalingrad, and subsequently hurled back, over the barren, bitter steppes, the unprepared and inadequately supplied invaders.

Until this century winter operations were seldom feasible with large armies because horse-drawn supply and movement bogged down in the mud of Europe's winters where roads were not blocked with snow. Only light raiding parties could move, so that larger forces remained huddled in forts and defended camps to await the spring campaigns.

This tradition, which may be traced throughout the course of European history, has surely now been shattered. This war has been a global one in which mechanical means of supply have made possible fighting in the Arctic and in winter. Bulldozers can build and maintain roads and airfields. Concrete, plate steel or ice runways make year-round flying possible. Tanks, tractors, trucks and snowmobiles make feasible winter operations on an unprecedented scale.

It had not been any failure of weapons in the cold that had prevented winter warfare. It had been the inability to move, to supply and to live away from main roads and railways. These have always been the problems of civilian frontiers. Wartime progress in winter techniques in Canada has thus, by good fortune, had to be directed not to weapons but to logistics, so that the answers obtained can now, after the war,

(Canadian Geographical Society map)

LOVAT SCOUTS IN TRAINING AT JASPER, WINTER 1944

Fully-armed troops practising roping and ice-climbing.

Left:—Camouflaged scouts picking up supplies dropped by parachute.

Mountaineering section skiing up Athabaska glacier and on to the Columbia ice-field; Mount Andromeda is on the left.

Soldiers pulling a companion up an ice cliff.

Right:—Skiers lowering an injured man on an improvised sled down a glacier.

A detachment starting on ski manoeuvres at the foot of Mount Athabaska.

American "Weasel" snowmobiles are not only able to wade or float, but can also cross snow or swamp on their wide rubber-coated tracks.

be directly applied to opening up the North. Winter training would, therefore, seem to be a natural and useful role for Canadian services in peacetime.

The significance of this coming change was not foreseen during the "phoney" war of the winter of 1939-40, but the impact of the new developments had been fully realized after the third winter of the war when fighting had spread to Africa, to Russia and to the Pacific.

In Canada, although local training and small-scale trials, especially for the British and Russians, had been started earlier, it was not until 1942-43 that extensive cold-weather tests of vehicles were carried out at Shilo, Manitoba.

During the winter of 1943-44 great trials of all types of army materiel were carried out under a variety of conditions from Newfoundland to Prince Albert by all three services jointly. The training of the British

The Canadian armoured snowmobile weighs four tons, but can, however, cross deep snow on its rubber tracks, each 30 inches wide. It is shown here carrying a casualty to shelter.

In order room a crews o Ox, fift adian mobiles armour alumin wood c window thick to

Although too heavy to float, the Canadian armoured snowmobile can nevertheless wade through four feet of water and climb out to travel 30 miles per hour along a highway.

Battalion of Lovat Scouts was carried out secretly at Jasper in preparation for a large-scale invasion of Norway which never materialized. These selected mountaineer troops were trained in skiing, snowcraft, camping and winter climbing by instructors chosen from the Canadian Army. The Canadian armoured snowmobile was ordered for their eventual use.

By 1944-45 all kinds of winter equipment were available in quantity for the first time. Our enemies were still in possession of much northern territory, so that it was a natural step to hold winter manoeuvres to test the materiel with troops and assess its capabilities and limitations. To provide a range of conditions, "Exercise Eskimo" was planned for mid-winter in the cold interior, "Exercise Polar Bear" in spring through the Coast Mountains, and "Exercise Lemming" on the truly Arctic barrens.

In order to provide more room and shelter for the crews on Exercise Musk-Ox, fifteen of the Canadian armoured snowmobiles have had some armour removed and an aluminium and plywood cab added. The windows are double-thick to prevent frosting.

CONTRASTING METHODS OF WINTER TRAVEL

Left to right:—

No. 1 Pack Troop, R.C.A.S.C., packing supplies in the Coast Range on Exercise Polar Bear.

Camouflaged infantry advancing on snowshoes through flat bush country on Exercise Eskimo.

Fully-equipped troops on snowshoes crossing the Rainbow Mountains of the Coast Range.

Naturally, the troops at that stage of the war were those still under training and there was a shortage of fit and experienced officers, but it was felt that what these troops could do operational units could do more easily, and the experience would be valuable.

To test particular vehicles or pieces of equipment a few men are enough, but the real difficulties facing armies only occur with large numbers. It is not enough to test each article alone in cold weather; it is necessary to see what happens to all the men and supplies for a whole force together. The problems of supply, tactics, housing, moving and camouflaging troops can most usefully be attempted with fairly large bodies of men. For these reasons the main winter manoeuvres were planned on a generous scale.

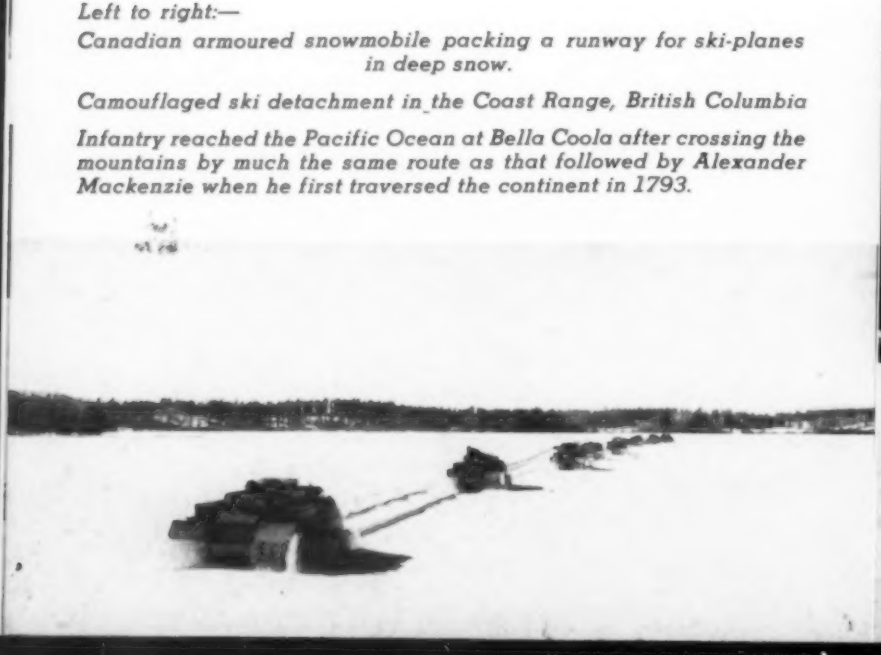
Exercise Eskimo, directed by Brig. M. H. S. Penhale, C.B.E., and Cols. W. W. Goforth, O.B.E., and D. C. Stevenson, consisted of an advance by a skeleton brigade of 2,000 all ranks over a distance of 183 miles from a base at Prince Albert, Saskatchewan, northward to Lac La Ronge, and a withdrawal through the same area. Starting on January 16th, 1944, it was completed in 37 days. The country traversed was generally undeveloped, consisting of a bush-covered undulating plain interspersed with lakes and muskeg. The average snow cover was 18

Left to right:—

Canadian armoured snowmobile packing a runway for ski-planes in deep snow.

Camouflaged ski detachment in the Coast Range, British Columbia

Infantry reached the Pacific Ocean at Bella Coola after crossing the mountains by much the same route as that followed by Alexander Mackenzie when he first traversed the continent in 1793.



inches, while the temperature ranged from —48° F. to +38° F.

Exercise Polar Bear was held through the Coast Range Mountains between Williams Lake and Bella Coola. The duration of the exercise, exclusive of the training period, was 55 days, from February to April 1945. The force, comprising 1,154 all ranks, covered a total distance of 626 miles. Temperatures varied from —31° F. to +54° F. and the route changed from a fair road over the rolling Chilcotin Plateau to narrow horse trails through magnificent snow-covered mountains. Snow cover ranged from nil in mud and rain to eight feet. The exercise was carried out by Pacific Command and Western Air Command under the immediate direction of Brig. G. A. McCarter, C.B.E., Col. M. D. Robertson, and Wing Commander R. I. Thomas, A.F.C.

On these exercises air supply and the building of advanced air bases were important features. The extreme vulnerability of winter troops to air attack was demonstrated, as was the ease of building airfields on frozen lakes and of otherwise facilitating close air co-operation.

During the preparation for these main exercises it became increasingly clear that there existed in Canada a third major climatic zone which had not been investigated by the services. The Arctic barrens,

Camouflaged infantryman in a snow weapon pit. These white cotton suits can be slipped over other clothing.

which cover a large part of the northern mainland and all the Arctic Islands, are marked not so much by more extreme temperatures as by the combination of long continuous periods of very cold weather coupled with high winds. Though flowers and travelling birds may provide a fleeting summer, in winter, without trees to afford shelter, the frozen lakes, sea and flat lands provide a white windswept desert whose size, and even existence, are seldom realized by southern Canadians. Few are aware that 32 per cent of our country lies north of the tree-line, that three of the Arctic Islands are each larger than Great Britain, or that areas as extensive as Scotland are unmapped and almost unknown.

The effect of these regions on the weather, radio and air travel of southern parts is not adequately understood, nor are their mining, trapping and fishing possibilities explored.

Admiralty explorations in the last century, the Hudson's Strait Expedition of 1927-28, Royal Canadian Air Force survey flights and isolated stations of the Royal Canadian Corps of Signals have been among the few service contacts with those vast territories where Government authority is normally maintained by small detachments of the Royal Canadian Mounted Police.

The good performance of men and vehicles on the other exercises encouraged the planning of a spring excursion into these regions. In March a small party left by train for Churchill. It was led by Lt.-Col. (then Major) P. D. Baird, R.C.A., and included Lt. T. H. Manning, R.C.N.V.R., as naval observer. These officers had spent many years on their own initiative and resources in exploring Southampton and Baffin Islands, and had both been among the few white inhabitants of the Northwest Territories to enlist in the services.

From Churchill thirteen men set out in six vehicles towing sleds loaded with supplies and petrol for the journey over the barrens to Padlei. In April, after only ten days of travel, they returned to Churchill, having completed 650 miles across country at rates mechanical vehicles had never before attained in that country. The present snowmobiles do not compete with tractors for economy or capacity, but surpass them in speed and passenger comfort.

With the end of the war in 1945 there was not further need for military preparations, but an interest in the North had been aroused. The lessons learnt in war could perhaps help to meet the urge for development of Canadian resources.

The services had three new techniques (each alone worth investigating) in connection with vehicles, air supply and navig-

Three-inch mortar crew of 1 Battalion Prince Albert Volunteers in action. Smoke and bursting rounds can be seen across the lake.

Company Commander of 1 Battalion King's Own Rifles of Canada issuing orders during a mock attack on Montreal Lake, Saskatchewan.

ation. "Exercise Musk-Ox" was planned to demonstrate them. Because it will be directed to the study of peacetime problems, without any consideration of weapons or tactics, only a small moving force will be required, with additional men to fly supplies and maintain air bases.

The long-range performance of snow-mobiles will be studied. They can be used around mines and construction camps as well as in the barrens. On account of their light track pressure they can cross swamps and muskeg, while some can float. They thus provide a possibility of all-year-round cross-country travel in the North.

Parachutes and air supply have been used to land and maintain whole divisions of 10,000 men in Burma and France. Airfields have been built in a few days during the war. These rapid and large-scale air operations may not yet be economical, but they offer possibilities of an extensive development of the North not possible with traditional small-scale dog travel.

Finally, the barrens around the north magnetic pole have been avoided as particularly difficult to navigate. Developments in astro-navigation and use of radar devices offer methods of overcoming these troubles.

The services have abundantly available the planes, vehicles, equipment and trained men for this operation. They have experience acquired overseas and along the northeast and northwest air routes to Europe and Asia. Accordingly, plans have been made whereby 45 men, again led by Lt.-Col. P. D. Baird, in twelve Canadian snow-mobiles (modified to provide covered cabs) are scheduled to leave Churchill on a 3,100-mile route on February 14th. They will be supplied throughout by R.C.A.F. planes and crews based at Churchill, Yellowknife, Norman Wells and Fort Nelson in turn. These crews, under Wing-Commander J. T. Showler, A.F.C., and Squadron-Leader J. F. Coombs, A.F.C., flying hundreds of miles over the barrens taking scientific readings as well as furnishing supplies, will have in many ways a more difficult job than the straightforward move of the force. So will the R.C.A.F. ground crews, maintaining large planes with limited facilities. It is hoped, though, that what is learned may be useful—as were the pioneer efforts of last-war pilots in the early bush flying of the 1920's.

The ground force will pass Baker Lake where an advance meteorological and air base

Soldier with standard winter pack-board to which is lashed his snowshoes, sleeping bag, shelter half, rations, ammunition, kit bag and parka. Neither snow-goggles (for mountain use) nor head strap are adjusted. Notice the loose wind-proof trousers and cotton neck cloth which, with open-mesh string undershirt, can control his body temperature.

AIRSTRIP AND ROAD CONSTRUCTION

Snowblower of an R.C.A.F. construction flight clearing advanced landing-strip on Anahim Lake, British Columbia.

R.C.A.F. Canso aircraft after landing on wheels on airstrip on Anahim Lake.

Bulldozer clearing a winter road for vehicles through the bush of Northern Saskatchewan.

AIR SUPPLY AND CO-OPERATION

Frozen fresh rations being "free-dropped" to "Eskimo troops" from an R.C.A.F. Norseman plane on wheels.

Norseman aircraft on skis, which has landed on a mountain lake for pick-up of supposed casualties.

will be established by Major G. W. Rowley, M.B.E., R.C.A.S.C., and a small party.

From Baker Lake to the Arctic Ocean the route crossse some of the least-known parts of Canada. It is all unmapped except for the Back River. This 500-mile-long river has only been travelled twice—by Capt. Back in 1834 and by two Hudson's Bay Company men in 1855. The force plans to strike the Arctic coast at Perry River, where an Eskimo keeps a trading-post, before crossing 100 miles of frozen ocean to reach Cambridge Bay, where the R.C.M.P. schooner *St. Roch**, which travelled the Northwest Passage, is now wintering. After a rest, and perhaps a short side trip, the force expects to follow the south coast of Victoria Island for 250 miles to Coppermine and then cross overland to strike the first trees near Port Radium. From there on, with spring coming, the force will travel more easily along tractor trails through a forested area. Early in May, it is scheduled to strike the Alaska Highway and follow the final 700-mile stretch from Fort Nelson to Edmonton.

In planning the expedition and in laying out a large and varied scientific programme, much help has been received from the Department of Mines and Resources, Dominion Observatory, Meteorological Service, and National Research Council, all of which are sending representatives, as well as from the R.C.M.P. and Hudson's Bay Company, whose posts will be visited.

It is an ambitious programme. Whether it is completely fulfilled or not, it will direct the attention of Canadians to the North they neglect, to the possibilities of opening it, and to the part the services can play in its exploration.

*See *Canadian Geographical Journal*, Feb., 1945.

CANADIAN ARMY EXERCISE LEMMING ON THE BARREN GROUNDS OF THE NORTHWEST TERRITORIES, 1945

Two Canadian officers building a snowhouse at Padlei, Northwest Territories. In the background is an American "Weasel", a Canadian armoured snowmobile, and two double-walled nylon tents. In the distance is a rock ridge.

A practice snowhouse built by Canadian troops. Where the snow is good the art of their construction can be learned in two days. Notice the low doorway and the rip-saw in the foreground used for cutting snow blocks out of drift.

Canadian Army Camp at Padlei, end of March, 1945. Three Eskimo dogs are picketed in the foreground.

"Weasels", towing sleds and snowmobiles, halted by a pressure ridge on the sea ice of frozen Hudson Bay in the first week of April, 1945.

EDITOR'S NOTE-BOOK

Frederic H. Peters, Surveyor General of Canada, has been connected with various survey projects throughout Canada ever since his graduation from the Royal Military College, Kingston, in 1904. His early work included the survey for the proposed Georgian Bay Canal. He was made Commissioner of Irrigation at Calgary, Alberta, in 1907, and in 1924 became Surveyor General of Dominion Lands, to which the additional duties of Chief of the Hydrographic Service were added in 1936. Both the Hydrographic Service and the Legal Surveys and Map Service, of which he has charge, were particularly active during the war in supplying hydrographic charts to the Allied navies and air navigation charts to the Allied air forces.

* * *

F. C. Goulding Smith was born in Montreal. After completing the engineering course at Acadia University in 1914 he joined the Hydrographic Service of Canada. During the first Great War he served for two years as an engineer with the Canadian Army Overseas, and for nearly the same length of time as lieutenant R.N.V.R. with the Hydrographic Department of the Admiralty. Returning to Canada in 1919, he resumed his work with the Canadian Hydrographic Service, and since then has engaged in charting operations on our Atlantic and Pacific seaboards, Great Slave Lake, Labrador, and extensively in Hudson Bay and Hudson Strait. He prepared the official volume of *Sailing Directions for the Hudson Bay Route*, and is the author of several articles in leading English periodicals.

* * *

Colonel J. T. Wilson, M.A., Ph.D., is the elder son of J. A. Wilson, a Vice-President of the Society. Born in Ottawa in 1908, he was educated there and at Toronto, Cambridge and Princeton Universities. When the war broke out he was with the Geological Survey of Canada in the Northwest Territories. Joining the Royal Canadian Engineers, he spent four years overseas before being brought back to become first Director of Operational Research at National Defence Headquarters, Ottawa. Exercises Polar Bear, Lemming and Musk-Ox are among the projects initiated by that Directorate. Colonel Wilson expects to join the staff of the Physics Department, University of Toronto, in the near future.

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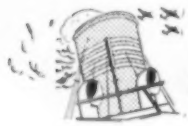

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AMONGST THE NEW BOOKS

The Pan-Germanic Web: Remaking Europe
by VLADIMIR GROSSMAN
(The Macmillan Company of Canada, Ltd., Toronto, $2)

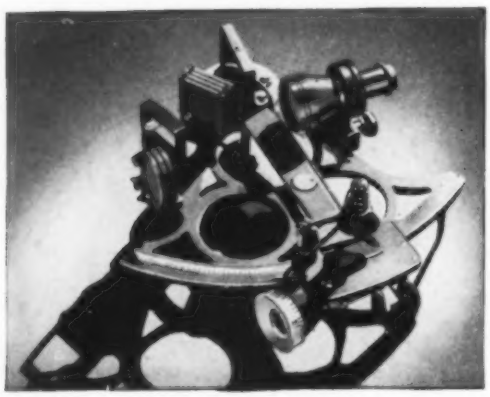
THIS book purports to be a study of German plans for the control of Europe and eventually of the world dating back to the seizure of the Schleswig-Holstein in the 'sixties of the last century and continuing through the war with Austria, the Franco-Prussian war and first and second great wars. The pattern of Germany's plans for an aggression is by no means unknown to people of this generation, and Mr. Grossman adds little that is new to a story that has been told and retold for thirty years. Some allegedly secret and definitely tiresome diplomatic correspondence with reference to the Schleswig-Holstein affair is embodied in the book, but the policies of Bismarck are of a milk and water character as compared with those of the gang of thugs who have, since then, led the world into two catastrophic wars.

The book will hardly present any radically new viewpoint to attract the reasonably informed reader of to-day.

* * *

A Book of Wayside Fruits
by MARGARET MCKENNY, EDITH F. JOHNSTON
(The Macmillan Company of Canada, Toronto, $2.75)

A SLIGHT book of seventy-five pages describing wayside fruits, mostly indigenous to the United States. Handsomely illustrated with plates in colour. —P.E.P.



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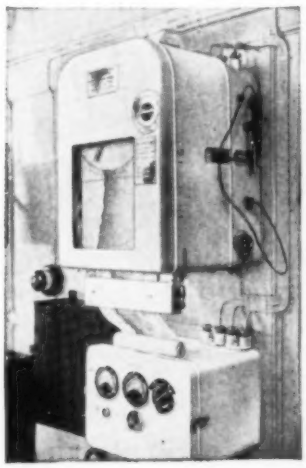

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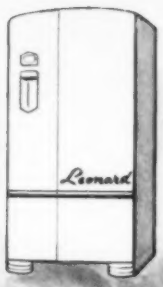

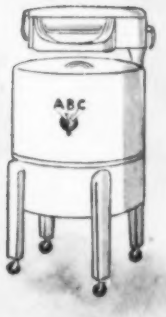

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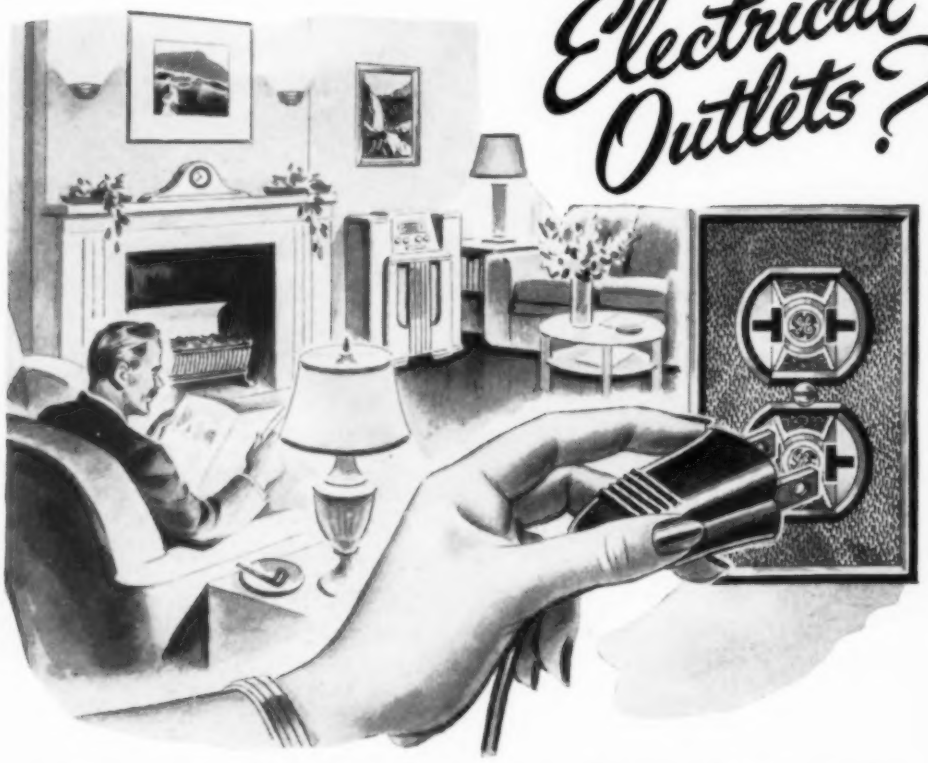

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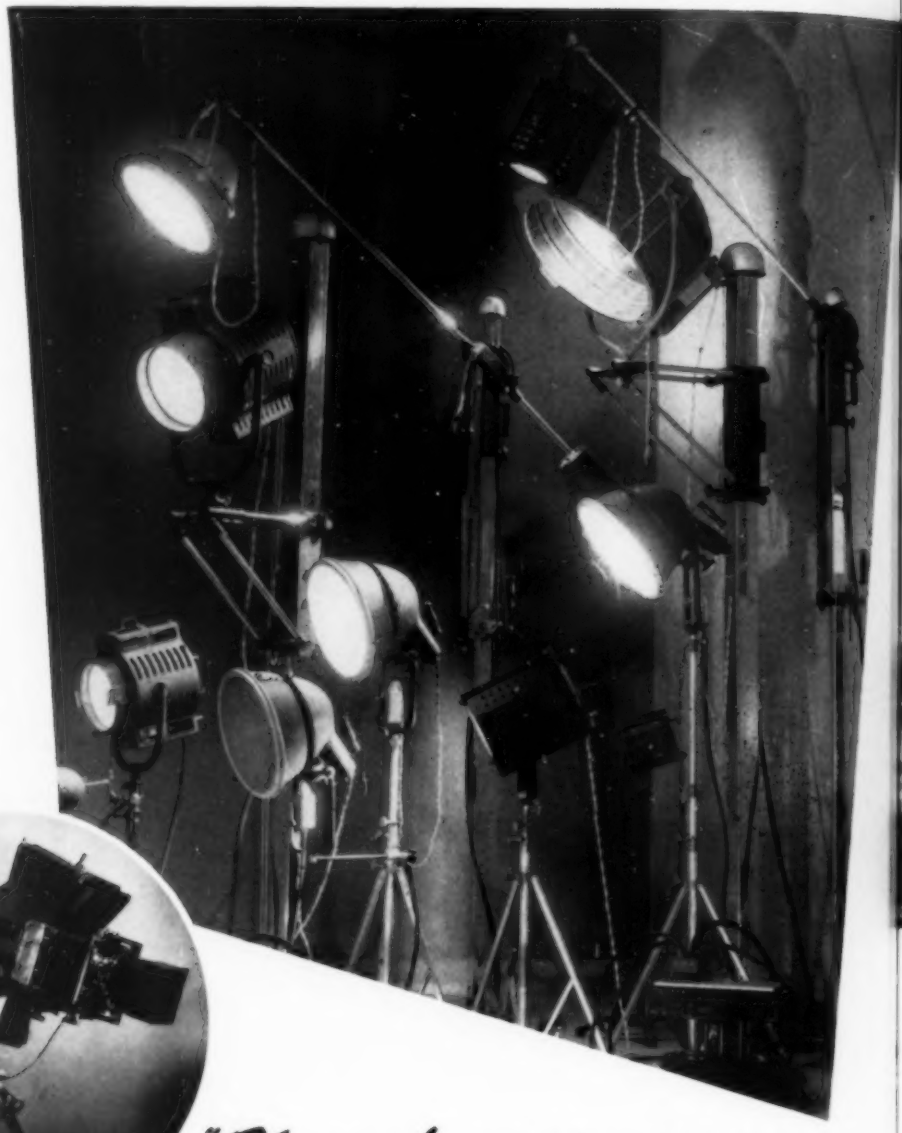

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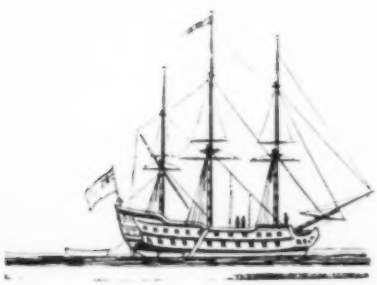

An ocean voyage was no picnic in the early Eighteen Hundreds. And when the vessel reached Montreal, passengers were debarked on the beach from small boats. But once ashore, the last word in luxury lay straight ahead. The Mansion House, with its wide terrace fronting the river, was famed for its food and hospitality. Rendezvous of the city's elite, home of the fur barons' exclusive Beaver Club, it was a welcome haven for tired travellers.

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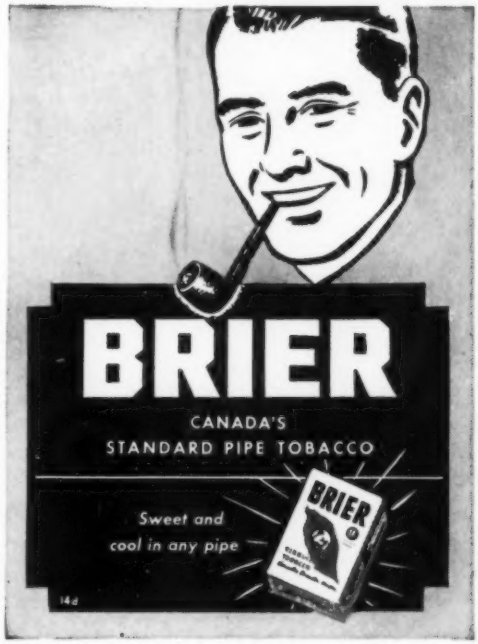

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ANNUAL MEETING *of*

The Canadian Geographical Society

The Society will hold its seventeenth Annual General Meeting in the Lecture Hall, National Museum, Ottawa, on Friday, February 22nd, 1946 at 8:30 p.m. Immediately following the meeting, Mr. A. E. Porsild, Curator of the National Herbarium and a Fellow of the Society, will deliver an address entitled "A Scientist Goes to Moscow", which will be illustrated by his own kodachrome slides. As a delegate representing The Canadian Geographical Society, Mr. Porsild attended the Scientific Congress held at Moscow and Leningrad last June to celebrate the 220th Anniversary of the U.S.S.R. Academy of Scientists.

"PHEASANTS IN THE SNOW"

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